

REPORT

PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

Quarterly Report #6

1 April 1969 – 30 June 1969

Contract NSR 06-004-063

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DENVER RESEARCH INSTITUTE
UNIVERSITY OF DENVER

QUARTERLY REPORT #6
PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

1 April 1969 - 30 June 1969

Contract NSR 06-004-063

- Prepared for -

National Aeronautics and Space Administration

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INTRODUCTION

This is the sixth report in a series prepared for the Office of Technology Utilization, National Aeronautics and Space Administration (NASA). It presents the results of three months of research on technology transfer conducted by the Industrial Economics Division of the University of Denver's Research Institute (DRI).

Material presented in this report was gathered and analyzed as a part of the Project for the Analysis of Technology Transfer (PATT). PATT was established in November 1967 to provide a better understanding of the technology transfer process by examining nonspace applications of NASA developed technology. To achieve this general objective, PATT has six more specific goals:

- (1) To collect data on actual and potential cases of transfer resulting from NASA's Tech Brief - Technical Support Package Program;
- (2) To operate a technology transfer data bank;
- (3) To analyze and evaluate information collected;
- (4) To document specific cases of technology transfer;
- (5) To perform a series of related research tasks;
- (6) To report research findings.

This report summarizes progress made to date in achieving these goals, and briefly discusses future activities. It builds on data presented in previous PATT reports as well as on results of other DRI research in technology transfer

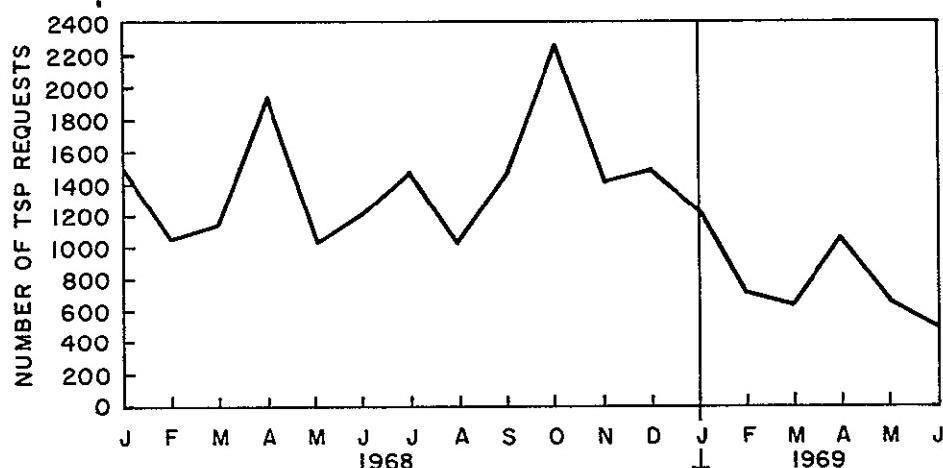
SECTION I. PATT SECOND QUARTER 1969 RESEARCH ACTIVITIES

PATT research during the second quarter of 1969 focused mainly on the following activities: continued operation of the Technology Transfer Data Bank; telephone interviews with selected persons requesting Technical Support Packages; a content analysis of 100 cases of technology transfer; and a special study of five frequently requested Technical Support Packages. Results of these and other PATT research activities are summarized in this section.

Transfer Data Bank Operations

The primary purpose of the Transfer Data Bank has been to provide comprehensive information on certain aspects of the NASA Tech Brief Program. Specific facts about program participants and their uses of NASA-developed technologies are gathered from four sources: letters sent to NASA centers by persons requesting Technical Support Packages (TSP's); TSP request letters sent to the Federal Clearinghouse; standard reference sources; and questionnaires sent to a 50 percent sample of TSP requesters.

One of the principal observations during the second quarter of 1969 was that the marked downward trend which started in January 1969 in the number of TSP's requested continued through the first six months, as shown in the figure below:



After the Clearinghouse approach (involving a charge for each TSP) was adopted with the publication of TB 68-10500 in late 1968, a substantial drop in the total number of TSP requests occurred. On the average, 600 fewer requests per month were made in 1969 compared with the same months in 1968.*

While the majority (91 percent) of TSP requests during the first six months of 1969 were sent to NASA field centers, the balance of requests shifted to the Clearinghouse:

Month	<u>Destination of TSP Request Letters</u>	
	NASA Centers	Clearinghouse
January	1,248	0
February	651	31
March	610	0
April	943	90
May	524	80
June	<u>295</u>	<u>220</u>
TOTAL	4,271	421

During the second quarter of 1969, PATT processed 2,142 requests for TSP's. PATT mailed 1,351 questionnaires to TSP requesters during the same three-month period. Seven hundred and twenty-four (53.5 percent) of the questionnaires were returned. In addition to providing information on the different ways requesters used the TSP's, the questionnaires identified users who appeared to have made significant applications of TSP information.

TSP Questionnaire Revised

The second quarter revision of the TSP questionnaire produced promising results. One hundred and three (51.5 percent) of 200 requesters contacted returned the revised -- and more lengthy -- questionnaire; this compared favorably with the average 54 percent response to the original TSP questionnaire. Analysis of the returned

*The drop in TSP request frequency cannot be attributed either (1) to a reduction in the number of Tech Briefs being published, or (2) to a failure on the part of NASA field centers to send copies of TSP request letters to DRI. Both of these alternatives were examined and eliminated as probable causal factors.

questionnaires indicated the need for minor changes in the scope, wording, and sequence of certain questions. (Appendix A contains the most recent version of the TSP questionnaire.) Assuming no major difficulties arise in obtaining Bureau of the Budget approval, the new questionnaire will be incorporated into the PATT system in September 1969.

Telephone Interview Results

During the second quarter of 1969, PATT staff members completed 64 telephone interviews with requesters who found TSP's to be of special usefulness in their work. The resulting reports are presented in Appendix B.

It is planned during the third quarter of 1969 to recontact approximately 50 requesters who indicated in 1968 that there was a strong possibility they would be making specific applications of NASA-developed technology. Results of those interviews should be available for inclusion in the next PATT quarterly report.

Content Analysis

Through 1968, 290 telephone interviews with potential users of NASA-developed technology were completed; another 69 were conducted during the first six months of 1969. During the past three months, the content of the written reports of those telephone interviews have been undergoing analysis.

Preliminary results of the content analysis are presented in Section III. This effort will continue until all available telephone interviews have been analyzed. Final results of the content analysis should be presented in the next PATT quarterly report.

Technology Transfer Library

The technology transfer library now contains more than 1,000 documents. During the past three months, work proceeded on the development of a numbering system for more efficient retrieval of information in the library. Next steps include identification of existing abstracts and preparation of new ones for all documents. It is anticipated that an updated bibliography, partially annotated, of works related to technology transfer will be published in November or December 1969.

Technology Transfer Seminar

Invitations have been mailed for a conference entitled, "The Environment and the Action in Technology Transfer: 1970-1980," scheduled for September 26-28 in Snowmass-at-Aspen, Colorado.

Special Research Tasks Undertaken or Completed

PATT personnel conducted a number of special research tasks during the second quarter in addition to regular examination of the Tech Brief Program. The special tasks were aimed at learning more about the ways NASA-developed technologies are disseminated, applied, and evaluated.

A customer evaluation of a NASA Regional Dissemination Center was completed early in the second quarter. A report presenting the results of the study was published in May 1969.

Questionnaires were sent to 370 persons ordering Gemini or Apollo photographs to determine how the photographs were used and evaluated. By the end of the second quarter, 162 (43.7 percent) of the questionnaires had been returned. The results of this particular task will be summarized in the next quarterly report.

A special study was undertaken to determine the reasons behind the wide popularity of five specific Technical Support Packages. Preliminary results of this analysis are presented in Section IV and Appendix C of this report.

Staff Participants in PATT

DRI staff participants in PATT during the past three months, and the primary activities of each individual, were as follows:

<u>DRI Staff Member</u>	<u>Primary Activities</u>
Dean C. Coddington, Research Economist	Project supervision
Richard Ball, Research Assistant	Telephone follow-up interviews
T. D. Browne, Research Economist	Administrative support and research design
James E. Freeman, Communications Researcher	Questionnaire revision, data analysis, content analysis

<u>DRI Staff Member</u>	<u>Primary Activities</u>
Terry Sovel Heller, Research Economist	PATT library
Ronald J. Hensen, Research Engineer	In-depth survey of TSP requesters, Gemini/Apollo photograph evaluation
William Hildred, Research Economist	Telephone follow-up interviews
Raymond Huey, Research Assistant	Content Analysis
Robert W. Joselyn, Research Economist	Gemini/Apollo photograph evaluation
James P. Kottenstette, Research Engineer	Basic research into the technology transfer process
H. E. Mew, Jr. Graduate Research Assistant	Telephone follow-up interviews, redesign of data bank procedures
R. O. Morgan, Research Economist	Telephone follow-up interviews
Barbara A. Stevenson, Administrative Assistant	Operation of data bank

In addition, John G. Welles and John S. Gilmore participated in planning meetings on PATT, reviewed reports and other documents emanating from the project, and provided overall technical and administrative support. Robert Venuti, Assistant Director and Chairman of the PATT Advisory Committee, also participated in the project during the reporting period.

**SECTION II. SECOND QUARTER TSP REQUESTS:
COMPARISONS OF 1969 AND 1968**

This section presents comparisons of TSP requests and questionnaires processed during the second quarters of 1968 and 1969.

A slight drop occurred in the proportion of requests coming from manufacturing and service organizations and there was a slight increase in requests coming from government agencies:

Source of Request by Industrial Category	Second Quarter Requests	
	1969	1968
Manufacturing	50.8%	57.8%
Services (Including Educational)	11.6	19.3
Government	10.9	7.8
Individuals	6.5	6.2
Wholesale and Retail		
Trade	3.6	1.6
Mining	1.5	1.4
Transportation, Communi- cation, and Utilities	0.6	1.0
Contract Construction	0.4	0.3
Finance, Insurance and Real Estate	0.2	0.2
Agriculture, Forestry and Fisheries	0.1	---
Undetermined	<u>13.8</u>	<u>4.4</u>
TOTALS	100.0%	100.0%

There were slight increases in the proportion of requests coming from firms in the 100 employees or less size range. Basically, however, the size distribution of requester organizations did not change in the quarters compared:

Source of Request by Organizational Size (Employees)	Second Quarter Requests	
	1969	1968
10,000 or more	36.9%	35.9%
5,000 to 10,000	6.2	8.2
1,000 to 5,000	8.1	9.6
500 to 1,000	2.7	4.0
100 to 500	4.4	6.1
50 to 100	1.1	0.8
10 to 50	3.0	1.5
1 to 10	9.1	6.9
Undetermined	<u>28.5</u>	<u>27.0</u>
TOTALS	100.0%	100.0%

The majority (71.8 percent) of 1969 second quarter requesters were interested in obtaining TSP's developed at the Marshall Space Flight Center.

NASA Center Originating TSP	Second Quarter Requests	
	1969	1968
Marshall Space Flight Center	71.8%	42.5%
Goddard Space Flight Center	12.7	3.4
Manned Spacecraft Center	5.4	2.4
Ames Research Center	4.6	13.3
Jet Propulsion Laboratory	2.3	14.7
NASA Headquarters	1.2	0.2
Electronics Research Center	1.1	0.3
Lewis Research Center	0.3	7.5
Space Nuclear Propulsion Office	0.2	6.4
Flight Research Center	0.2	0.7
Kennedy Space Center	0.1	3.8
Langley Research Center	0.1	4.7
Other Centers	0.0	0.1
TOTALS	100.0%	100.0%

There was some shift during the second quarter in the technical areas of interest to TSP requesters. Requests for TSP's in the mechanical area increased from 12.7 percent in 1968 to 22.7 percent in 1969. Interest in electrical and electronic TSP's, on the other hand, edged downward from 42.5 to 39.1 percent. Requests for computer program TSP's dropped substantially.

TSP Subject Area	Second Quarter Requests	
	1969	1968
Electrical (Electronic)	39.1%	42.5%
Materials (Chemistry)	30.2	31.8
Mechanical	22.7	12.7
Physical Sciences (Energy Sources)	6.2	6.1
Computer Programs	0.7	4.5
Life Sciences	1.1	2.4
TOTALS	100.0%	100.0%

The impact of the Small Business Administration (SBA) on the Tech Brief program is reflected in the comparisons. Analysis of 1969 PATT questionnaire data revealed that 30.4 percent of the requesters in smaller firms (fewer than 500 employees) first learned about the availability of TSP's through the SBA. By contrast, only 2.5 percent of small firm requesters cited the SBA as source in 1968. In the case of larger firms, the source patterns did not change significantly in the periods compared: NASA publications, particularly Tech Briefs, provided initial TSP awareness for 60 percent of the requesters in larger organizations.

Most requesters contacted rated the TSP's "good" in terms of usefulness. No major differences in TSP usefulness ratings occurred in the periods compared:

TSP Usefulness Rating	<u>Second Quarter Questionnaire Data</u>	
	1969	1968
Excellent	13.0%	15.6%
Good	38.7	40.6
Fair	26.1	25.1
Poor	5.9	7.8
No Answer	<u>16.3</u>	<u>10.9</u>
TOTALS	100.0%	100.0%

The most popular TSP during the second quarter of 1969 was the Contamination Control Handbook which originated at Marshall Space Flight Center. Other TSP's in the top ten are identified in the following table:

Tech Brief Number	Title and Originating NASA Center	Request Frequency	Percent
B68-10392	"Contamination Control Handbook" (Marshall)	273	12.7
B68-10069	"Principles of Optical-Data Processing Techniques"(Goddard)	151	7.1
B68-10397	"Charts Designate Probable Future Oceanographic Research Fields" (Marshall)	95	4.4
B68-10395	"Design of Fluid-Duct Bends with Low Pressure Loss" (Marshall)	94	4.4
B68-10385	"Electromotive Series Established for Metals Used in Aerospace Technology" (Marshall)	88	4.1
B68-10394	"Nondestructive Testing of Brazed Rocket Engine Components" (Marshall)	70	3.3
B67-10097	"Heater Control Circuit Provides Both Fast and Proportional Control" (Lewis)	61	2.9

B68-10183	"Detection and Location of Metallic Objects Imbedded in Nonmetallic Structures" (Marshall)	41	1.9
B68-10396	"Evaluation of Superconducting Magnets, a Study" (Marshall)	39	1.8
B67-10196	"Technique for Strip Chart Recorder Time Notation" (Goddard)	31	1.4
All Other Tech Briefs		<u>1,199</u>	<u>56.0</u>
TOTALS		2,142	100.0

SECTION III. CONTENT ANALYSIS OF TELEPHONE INTERVIEWS

Since January 1968, PATT personnel have interviewed more than 300 persons who had requested and used NASA Technical Support Packages (TSP's). Those interviews were designed primarily to learn how NASA-developed technologies were used and with what resulting benefits or problems. Until recently, each report of an interview had been treated as a separate case study. A decision was made during the second quarter to interrelate and summarize the contents of the reports. It was anticipated that such an effort might provide additional insights into the transfer of technology through the Tech Brief Program.

The content analysis technique was used to systematically and objectively quantify the information contained in the telephone interview reports. A content analysis code was generated through an intensive examination of a randomly-selected sample of 40 interview reports. The resulting code was then used to analyze a second random sample of 100 reports.

Results of the analysis showed that the 100 cases could be divided into two categories: those reporting immediate results following the application of information in TSP's, and those not reporting immediate results. Thirty-six respondents reported a variety of immediate results: a new or improved process; actual development of new products; improvement of existing products; new uses for existing products; cost reductions; or stimulation of additional research. Of the 64 respondents not reporting immediate results, 23 said they anticipated specific results at some time in the future, and 17 reported that results were not yet determinable.

Focusing on the 36 respondents reporting actual results, the financial benefits reported could be divided into three categories--increased sales, monetary savings, and time savings:*

*Respondents reporting financial benefits in one of these categories were not excluded from reporting benefits in the other two; therefore, the numbers total more than 36.

Sales increases. Three respondents reported sales increases totalling \$1.1 million per year; another five respondents who reported sales increases said that the actual amount was not determinable.

Dollar savings. Five respondents reported dollar savings totalling \$20,450; eight others reported dollar savings but could not place a monetary value on these savings.

Time savings. Four respondents reported time savings totalling 1,000 man hours; another eight individuals said that they could not estimate the time saved.

No financial benefits reported Nine respondents did not report any financial benefits.

Concerning specific types of technological advances, ten respondents reported the development of a new or improved process or technique, ten reported improvement of existing products, six reported development of new products, four reported stimulation of basic and applied research, three reported new uses for existing products, processes, or techniques, and three reported other technological benefits.

Twelve (33 percent) of the 36 individuals first learned about the availability of TSP's through trade and professional publications. (This compares with 20 percent of all TSP requesters who first heard about TSP's through trade and professional publications.) Ten first learned of the TSP through reading a Tech Brief, three learned of the TSP by personal contact, one was alerted to the availability of the TSP by the Small Business Administration, one was a regular recipient of NASA publications, and in nine cases the first awareness came from unidentified sources.

Assuming that the random sample of 100 is somewhat representative of the more than 300 telephone cases on hand, the TSP benefits can be multiplied by three to obtain a more accurate indicator. In addition, it is possible to double the resulting amounts to take account of the fact that roughly 50 percent of all TSP requesters did not return completed questionnaires.* Thus, the results of the content analysis of the 100 cases can conservatively be multiplied by a factor of six to develop a partial indicator of benefits associated with use of TSP's ordered from late 1966 through mid-1968.

The content analysis will continue until all cases have been analyzed. Considerably more detailed information than is reported here will be presented in the seventh PATT quarterly report.

* In 1968, PATT conducted a special survey of nonrespondents and, at that time, determined there were very few important differences between the two groups (see PATT Quarterly Evaluation Report No. 3, Section III).

SECTION IV. AN ANALYSIS OF FREQUENTLY REQUESTED TSP'S

There is substantial variation in the number of TSP requests generated by Tech Briefs. Of the 576 Tech Briefs issued in 1968, 442 (77 percent) generated five or less inquiry letters.* Twenty-one Tech Briefs resulted in 50 or more TSP requests.

As a part of a continuing effort to understand why some TSP's are ordered and others are not, PATT examined five frequently requested TSP's in some detail. The specific purpose of this exploratory research was to hypothesize as to why certain Tech Briefs have been successful in creating demand for TSP's.

Procedure

The criteria used in selecting Tech Briefs for the exploratory study were: (1) 50 or more requests for the TSP, (2) different types of technology were to be presented; and (3) the Tech Briefs must have originated at different NASA or AEC centers.

Five Tech Briefs which met the criteria were selected for analysis:

Tech Brief Number	Title	Number of TSP Requests
65-10156	Inorganic Paint is Durable, Fire-proof, Easy to Apply	269
67-10374	Handbooks Describe Eddy Current Techniques Used in Nondestructive Testing of Metal Parts and Components	150
66-10624	Miniature Pressure Telemetry System	63
67-10401	Metal Tube Reducer is Inexpensive and Simple to Operate	61
67-10240	Vis-A-Plan Management Technique	58

*315 of the 1968 Tech Briefs generated no requests for TSP's.

Approximately one-half of the TSP requesters had returned the standard PATT questionnaire. The response rate was raised to approximately 70 percent by sending another copy of the questionnaire to non-respondents.

Eighteen requesters were interviewed by telephone. These interviews supplemented 46 previous interviews reported in earlier PATT reports.

Case descriptions were developed for each of the five Tech Briefs selected for detailed study (see Appendix C).

Hypotheses

Examination of the data suggested a number of hypotheses related to high TSP request frequency. The hypotheses will be tested in future PATT research.

Hypothesis I. Tech Briefs emphasizing economic benefits, such as increased sales or reduced costs, will tend to generate a larger number of TSP requests.

Although the main purpose of the Tech Brief/TSP Program has been perceived as the reporting of technology, we believe that the potential economic benefits are an important motivator in generating TSP requests. To test this hypothesis, we plan to review and classify the titles and contents of approximately 300 randomly selected Tech Briefs. The number of TSP requests by category of title will be identified from the Technology Transfer Data Bank.

Hypothesis II. The maturity level of the technology is of interest to Tech Brief recipients, and influences their decision to order or not order the TSP.

Approximately one-fifth of the requests for TSP's are from people interested in solving a specific technical problem. The stage of development of the technology affects the probability of the TSP actually helping in problem solution. In other words, the better developed the technology, the better the chances of a technical application taking place. To test this hypothesis, we will attempt to classify the degree of development of 300 TSP's (the same ones selected to test Hypothesis I), and look at the number of requests and types of applications. Results of the analysis should help in identifying and

screening technology prior to the development of a Tech Brief and TSP.

Hypothesis III. Tech Briefs emphasizing unique technical characteristics generate a higher response for TSP's.

We believe Tech Brief recipients can better judge the value of the technology reported if the technology is contrasted with existing technologies. The Tech Brief describing the pressure transducer (see Appendix C-3), for example, stated that the device is clearly superior to other methods of monitoring internal physiological characteristics of animals. The 300 randomly selected Tech Briefs will be reviewed to see how many do make such comparisons, and whether or not such comparisons appear to have influenced the volume of requests.

Hypothesis IV. The announcement of the availability of TSP's in professional or business publications tends to increase TSP request frequency.

Publications most effective in stimulating inquiries are those journals and magazines which the members of a profession or industry are likely to use as sources of work-related information. Each of the five frequently requested TSP's examined in this study received widespread coverage in professional and trade publications. One example is Medical Electronic News.

The revised TSP questionnaire (see Appendix A) is designed to generate better data on the source of awareness of the TSP. We plan to run special tabulations, after a significant number of questionnaires have been received, to test the relationship of trade press coverage to TSP requests and to technology usage.

Hypothesis V. Tech Briefs announcing the availability of manuals or training aids will tend to generate a large number of TSP requests.

This hypothesis is based on a review of the most heavily requested TSP's over the past few months, and is also borne out by the non-destructive testing manual (see Appendix C-2). A large portion of Marshall TSP request volume is directly related to this type of situation.

We plan to identify manuals and related items issued since January 1968, and to identify request volume, requester characteristics, and uses made. The results will be compared with those achieved by all other Tech Briefs published during the same period.

APPENDIX A

Revised TSP Questionnaire

University of Denver
COLORADO SEMINARY

DENVER RESEARCH INSTITUTE UNIVERSITY PARK, DENVER, COLORADO 80210

QUESTIONS CONCERNING THE NASA TECHNICAL SUPPORT PACKAGE

We would greatly appreciate your help in providing the information requested in this questionnaire. It will be of value to NASA personnel responsible for the Technology Utilization Program. Please answer by checking appropriate boxes.

1. How did you first learn about the availability of the NASA Technical Support Package (TSP) referred to in the cover letter?

- From an engineer, scientist, or manager in my own organization
- From a librarian in my organization
- From a person outside of my organization
- Read about this TSP in a trade publication
- Read about it in a professional journal
- Read a NASA Tech Brief announcing this TSP
- Other (specify): _____

2. If you first learned about the TSP in a NASA Tech Brief, how did you acquire the Tech Brief?

- Did not learn about TSP in a Tech Brief
- Received the Tech Brief directly from NASA
- Received the Tech Brief as part of internal distribution within my organization
- Received it from someone outside of my organization
- Other (specify): _____

3. What was your most important reason for ordering this particular TSP?

- To keep abreast of developments in my field(s) of interest
- To assist in solving a specific problem or in getting the most up-to-date answer to a particular question
- To assist others in my organization in their research and development activities
- Other (specify): _____

4. What is your estimate of the number of hours you and other members of your organization spent in reviewing, studying or applying information contained in the TSP you ordered?

_____ Hours

5. At which of these levels of scientific or technical development were you working when you requested the TSP?

- Acquiring a scientific understanding of nature (basic research)
- Demonstrating a new technical capability on a laboratory basis
- Applying new technical capability to a full-scale prototype (field trial)
- Putting new technology to its first operational use
- Other (specify): _____

6. What was your primary use of the information in the TSP?

- To help solve a specific technical problem
- Passed it along to someone else for possible use
- Reviewed and filed it for future reference
- Discarded it
- Other (specify): _____

7. If you used the TSP for problem solving, how important was it in the solution of that problem?

- Did not use it for solving a technical problem
- Not important at all (irrelevant, not applicable)
- Slightly important (less than 5% input to problem solution)
- Moderately important (about 5% to 14% input to solution)
- Quite important (15% to 49% input to solution)
- Crucial (50% or greater input to solution)

8. If any beneficial result(s) followed from your use of the TSP, please indicate which one(s):

- No beneficial results I can think of
- Kept me abreast of developments in my field(s) of interest
- Stimulated basic and applied research
- Developed new process(es) or technique(s)
- Improved existing process(es) or technique(s)
- Developed new product(s)
- Improved existing product(s)
- Reduced operating costs
- Saved time, manhours
- Increased sales
- Other (specify): _____

9. If you experienced any problem(s) in trying to use information in the TSP, please indicate which one(s):

- No difficulties I can think of
- Patent clearance too complicated
- Technology in TSP was not well enough developed for my purposes
- Insufficient information in TSP
- Incorrect information in TSP
- Unusually long delay in obtaining the TSP
- Excessive adaptation costs
- Other (specify): _____

10. Please rate the information contained in the particular TSP you ordered in terms of each of the sets of words below. Make a check mark () in the appropriate space for *each* pair of words. [Do not omit any of the items and place only one check mark on any one set of words.]

TSP RATING

important unimportant
old new
complete incomplete
unclear clear
unusual usual
relevant irrelevant
helpful unhelpful
superior inferior
useless useful
poor reproduction good reproduction

11. What type of an organization do you work for (check only one)?

- A manufacturing organization (e.g., electrical machinery, testing instruments, transportation equipment)
- A service organization (e.g., education, retail sales, business consulting, medical services, research)
- A government agency (e.g., Federal, state, local)
- Self-employed
- Other (please specify): _____

12. How large is the organization for which you work?

- Self-employed
- 1 to 5 employees
- 6 to 49 employees
- 50 to 499 employees
- 500 to 999 employees
- 1,000 to 4,999 employees
- 5,000 to 9,999 employees
- 10,000 employees or more

13. Please check the appropriate category for your annual income level.

- Less than \$12,500
- \$12,500 to \$19,999
- \$20,000 or more

14. What is your *primary* job (check only one)?

- Engineer
- Scientist
- Manager, Supervisor
- Technician
- Librarian
- Other (please specify): _____

15. What is the highest completed level of your formal schooling?

- Less than a bachelor's degree
- B.A., B.S., or equivalent
- M.A., M.S., or equivalent
- Ph.D. or equivalent
- Other (please specify): _____

16. Do some of your responses contain proprietary information? If yes, please indicate which ones. No information which you identify as proprietary will be associated with you or your organization.

Yes (specify): _____

No

Your Name: _____ Your Title: _____ Today's Date: _____

Please return completed questionnaire to:

Industrial Economics Division, TSPQ
Denver Research Institute
University of Denver
Denver, Colorado 80210

APPENDIX B

Case Studies of Technology Transfer Through the TSP Program

Case Number: 81220870

The Ames Medical Department of the University of California-San Diego, has developed and is using an igniting system for vapor lamps as developed and reported by the Jet Propulsion Laboratory.

<u>Subject</u>	<u>Technology Source</u>
University of California-San Diego Ames Medical Department-A0109 5126 Urey Hall La Jolla, California 93037 714-453-2000 Contact: William Brown Associate Engineer- Bioengineering	Jet Propulsion Laboratory Tech Brief: 63-10262

The Ames Medical Department at the University of California needed a stable light source with a low noise circuit capability for their experiments in blood velocity measurement. Upon learning of the igniting system developed by Jet Propulsion Laboratory through an article in a technical publication, contact was made with Jet Propulsion Laboratory for the available NASA information.

Based upon the Technical Support Package received, Mr. Brown reported that they built one igniting system which resulted in tangible and intangible benefits by providing "a stable means of light for our experiments." It also diminished starting times for their experiments since it increased the length of time a lamp could be used "at least 1/3 to 1/2 longer than under normal starting conditions." The igniting system was built for a cost of \$8 to \$10 for parts and five or six hours labor. Although the exact savings could not be estimated, Mr. Brown felt they were considerably higher than the investment.

This was Mr. Brown's first experience with a NASA publication, but he was delighted with this experience. He felt the quantity and quality of this publication was "superb." The NASA information was "very important and allowed construction of the igniter the first time."

RB:ag
7/9/69

Case Number: 80710380

A vacuum cleaner marketed by Fairfax Industries, Washington, D. C. has been improved by using a NASA inorganic paint on interior surfaces.

<u>Subject</u>	<u>Technology Source</u>
Fairfax Industries 5511 Fourteenth Street, N. W. Washington, D. C. 20011 202-726-1200	Goddard Space Flight Center
Contact: William Arbeiter President	Tech Brief: 65-10156

Mr. William Arbeiter, President of Fairfax Industries, heard on his car radio a special news note about an inorganic paint that had been developed at Goddard Space Flight Center. About four months later his firm developed a need for a paint that would withstand considerable abuse. Buyers of his firm's vacuum cleaners were complaining about deterioration of the interiors of the vacuum cleaner tanks.

Mr. Arbeiter recalled the radio story and sent an inquiry to the Atomic Energy Commission. The letter was routed to Sam Snyder, at Space Nuclear Propulsion Office, who forwarded it to Goddard Space Flight Center. Mr. Arbeiter soon received the relevant literature, which he reviewed and consulted about with colleagues for about four hours. He then contacted L. H. Walters, Chief Engineer of Regina Products Canada Limited, Welland, Ontario, Canada. Mr. Walters obtained a paint from Mercury Varnish Co., Ltd., St. Catharines, Ontario, and sent it to Mr. Arbeiter.

Application to the tanks ended the problems of rust and peeling. The coating passed all tests, including abuse from salt, sand, oil, and detergents, and it is now specified for the tanks. Mr. Arbeiter estimated that over \$2,500 has been saved by the cessation of repainting, repair work, and the public relations value of having an improved product is considerable.

Case Number: 80710380 (Cont.)

Fairfax Industries has not used any other Technical Support Packages, but Mr. Arbeiter requested further information about the TU program. Concerning his experience in this case, Mr. Arbeiter commented that he was ". . . flabbergasted. The response was great, very fast."

WH:ng
5/14/69

Case Number: 80606116

Dr. David Lilly of the University of Iowa, Department of Speech Pathology and Audiology, is currently using a miniature biomedical amplifier developed at Ames Research Center in his audiology studies of human subjects.

<u>Subject</u>	<u>Technology Source</u>
University of Iowa Department of Speech Pathology and Audiology Iowa City, Iowa 52440 319-353-5146 Contact: Dr. David Lilly Audiologist	Ames Research Center Tech Brief: 65-10203

Dr. David Lilly, an audiologist, has some knowledge of electronics. He first heard about the Ames biomedical amplifier in the trade press and sent for the NASA Technical Support Package. The amplifier combines high performance with low power drain. He and his laboratory assistants built such an amplifier and spent approximately \$50 for components. He was quite happy about his success with the amplifier. The data received from NASA included all component values and types so that it was necessary only to build it up from the purchased components; it worked at once.

By using the NASA information, Dr. Lilly considered that he saved both time and money. But, even more important Lilly said that his group was not capable of generating such a design themselves. In addition, he was quite pleased to have received the NASA selected circuits manual (SP-5046), which provided him with an additional two or three circuits which have been used for other purposes.

Dr. Lilly and his associates are not regular participants in the NASA Tech Brief program, but they feel that they benefited by this one-time use.

AV:ag
6/27/69

Case Number: 90122052

The U. S. Navy Medical Neuropsychiatric Research Unit at San Diego, California has used information from the Ames Research Center on a tiny bio-medical amplifier which they expect will play a key role in their research on sleep deprivation.

<u>Subject</u>	<u>Technology Source</u>
Department of the Navy	Ames Research Center
U. S. Navy Medical Neuropsychiatric Research Unit	Tech Brief: 65-10203
San Diego, California 92152	
714-225-3672	
Contact: Paul Naitoh, Ph.D.	

Dr. Naitoh advised that at the U. S. Navy Medical Neuropsychiatric Research Unit, they are interested in studying the effects of sleep deprivation on subjects. They are particularly interested in viewing a subject on a twenty-four hour a day basis so that effects can be observed during the total behavioral period. In order to accomplish this part of the study, they constructed a telemetry system. The amplifier used in the system, however, was not satisfactory--forcing them to temporarily curtail this part of the study.

Based upon a need for a satisfactory amplifier, Dr. Naitoh learned of the amplifier developed by NASA through the Tech Brief and through an article in one of the journals in the bio-medical field. Dr. Naitoh contacted the Ames Research Center who not only forwarded the Technical Support Package, but also advised that they understood this amplifier was now available commercially from D & H Associates, Sunnyvale, California. Dr. Naitoh advised that they have now received prices and specifications from this company and that they intend to procure one of the amplifiers as soon as additional budget for their research is released. However, based upon the information received from NASA, they have expended at least one man month of effort in evaluating and partially constructing the required telemetry system. According to Dr. Naitoh, the NASA information and the availability of the required amplifier commercially, could save them at least two or three months development time and the equivalent of three man months effort on the part of a highly skilled technician, plus hardware costs.

Case Number: 90122052 (Cont.)

Dr. Naitoh regularly receives NASA publications which he disseminates to others on the basis of interest. He also maintains a file on these publications for future reference. Dr. Naitoh commented that the publications "are excellent" and that the service received in obtaining the Technical Support Packages is "very good and fast." The Technical Support Package on the amplifier, according to Dr. Naitoh, was "very important" to their requirement and "it was accurate and detailed enough to go right ahead with the project."

RB:ml
7/18/69

Case Number: 81119290

The Bedford Engineering Corporation, Bedford, Massachusetts is attempting to utilize a voltage controlled oscillator developed at the Jet Propulsion Laboratory.

<u>Subject</u>	<u>Technology Source</u>
Bedford Engineering Corporation 124 South Road Box 252 Bedford, Massachusetts 01730 617-275-8400 Contact: Mr. Herbert L. Aronson	Jet Propulsion Laboratory Tech Brief: 65-10223

The Bedford Engineering Corporation, a small instrumentation firm, employs 20 people, working primarily in the optics and communication fields. At present, the company is engaged in a telemetry project and has been able to use the Jet Propulsion Laboratory voltage controlled oscillator, thus saving the development cost of an alternative circuit. The engineering staff of the firm spent approximately 30 hours reviewing the information, and in building and testing the circuit.

Bedford Engineering had been searching the literature for circuitry information when Mr. Aronson found a reference to the voltage controlled oscillator in a professional journal. He felt that the information contained within the NASA Tech Brief and Technical Support Package was very valuable in his work.

No estimates were offered by Mr. Aronson as to savings realized due to the use of this NASA information.

TM:ag
6/20/69

Case Number: 80916805

The Allis-Chalmers Company is using an optical alignment system developed by M. P. Thekaekara of Goddard Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Allis-Chalmers General Products Division Custom Pumps Box 512 Milwaukee, Wisconsin 53201 414-774-3600 Contact: A. P. Himes Senior Development Engineer	Goddard Space Flight Center Tech Brief: 65-10253

A precision optical alignment system, which uses an oil-damped mercury pool to reflect a light beam, is in use in the Allis-Chalmers factory in Milwaukee. It is used to certify the straightness of shafts as much as 30 feet in length. These shafts are checked out while in a vertical position; a scope is mounted at the top of the shaft and the mercury pool is placed at the bottom.

Prior to adoption of this system, only half a shaft could be checked; when this half was found to be straight, the shaft was lowered from the vertical position and sent to the next station in the assembly sequence. Any error at this check point would be compounded at each succeeding step. With the new optical alignment device, assembly sequence will be properly accomplished following the passage of test for total shaft straightness. Savings have been realized but a precisely quantified estimate was not available. Costs of implementing the system were minimal: 10 to 15 hours and a few brackets and adapters.

The Technical Support Package was sent to Mr. Himes by a colleague who knew of his need for a better alignment system. (A similar system had been used but it did not function properly because the reflecting mirrors tended to fog.) Although the firm's library is a Tech Brief subscriber, there is no effective internal dissemination system to get the data into the hands of appropriate individuals. The company librarians are not aware of the divergent needs of individual departments and tend to minimize general circulation of technical information. This is helpful in reducing the volume of inconsequential material that must be screened, but often buries timely and significant materials. In

Case Number: 80916805 (Cont.)

general, Mr. Himes' section utilizes traditional and well-known techniques. Only in instrumentation development are new applications prevalent.

Mr. Himes has reviewed several Tech Briefs for new ideas and has found the format to be satisfactory, particularly since traditional information is readily available. Mechanical and electrical engineers are the primary users of Tech Briefs at Allis-Chalmers.

WH:ag
6/27/69

Case Number: 81119795

The Communications Satellite Corporation, Washington, D.C. is incorporating the use of enclosures for inert-gas welding as defined in information received from the Lewis Research Center.

<u>Subject</u>	<u>Technology Source</u>
Communications Satellite Corporation 2100 L. Street N.W. Washington, D.C. 20036 202-466-4845	Lewis Research Center
Contact: Robert R. Redick Supervisor, Mechanical Shops	Tech Brief: 65-10338

At the Communications Satellite Corporation, Mr. Redick stated that the laboratory is charged with the responsibility of keeping up with the state-of-the-art, particularly as related to earth satellites and with the responsibility of constantly furthering satellite technology. Therefore, the mechanical shops are concerned with any technology which will improve upon processes and methods used in research and development manufacturing. Mr. Redick was sure that the use of the enclosures in conjunction with their TIG (Tungsten Inert Gas) welding would improve their joining techniques for microwave research and development.

According to Mr. Redick, the Communication Satellite Corporation is in the process of building a new research and development laboratory and it will use the enclosures suggested by NASA in conjunction with much of the inert-gas welding and brazing equipment. At this time, Mr. Redick is not sure exactly how much will be budgeted for the enclosures, but he estimated that at least \$2,000 to \$3,000 would be required. Mr. Redick did not feel that he could estimate the internal effects of the enclosures in terms of development savings or efficiency, but he did state that this type of technology "makes possible the fabrication of parts that would be difficult or impossible to make otherwise."

The Communications Satellite Corporation library regularly receives NASA publications and they are available for reference. The shop does not normally receive these publications unless requested. In this case, Mr. Redick became aware of the Tech Brief after touring Goddard Space Flight Center. He said he also noticed a reference to the Tech Brief

Case Number: 81119795 (Cont.)

in one of the welding publications. Mr. Redick said the Technical Support Package was very important to him since it was "the only seriously written document available." He also thinks that "any information of this type is always valuable."

RB:bs
7/18/69

Case Number: 80815015

A NASA Ames miniature sensing and transmitting device is being investigated for potential use in a University of Iowa medical research project.

<u>Subject</u>	<u>Technology Source</u>
R. L. Dreyer, Ph. D. Department of Biochemistry College of Medicine The University of Iowa Iowa City, Iowa 52240 319-353-3286	Ames Research Center Tech Brief: 66-10057

Dr. R. L. Dreyer, a biochemist at the University of Iowa, is evaluating and experimenting with a miniature bio-telemetry instrument for use in a study of heat production in adipose tissue. The subjects of the study are hibernating bats.

Because the bats are small, the sensor-transmitter instrument must be quite small also. Anything weighing more than seven grams is not acceptable, and a five-gram maximum is desirable. The Ames instrument has not been successfully adapted because of its weight, although efforts have been made to strip and shave components from it to reduce its weight. An attempt was made to modify the device by introducing a Mallory button cell; this brought the weight down to 7.2 grams and yielded a 40-milliwatt output signal (only 20 mware required, so it may yet be possible to reduce the weight to tolerable limits). The modified 7.2 gram device has not yet been implanted in a bat, and this will not be attempted until next winter when the bats are ready again for hibernation.

Dreyer's Research efforts encountered an additional problem: it is quite difficult to implant the instrument in a sleeping bat without arousing it. Some observations were made with the instrument implanted in a waking bat held in a restraining harness. The sensor and transmitter functioned properly, and produced a changed pitch in the FM signal as the animal's temperature increased. Dr. Dreyer noted also that a more sensitive FM receiver would be required if he were to try to monitor the bat in flight.

Case Number: 80815015 (Cont.)

The NASA instrument has been uniquely valuable in the project. The Technical Support Package may account for as much as 75 percent of the useful information related to the development of telemetry achieved for the study. Dreyer became aware of this Tech Brief through an article in Medical Electronic News, May 1968. After receipt of the Technical Support Package he spent about 15 hours building the instrument, with the assistance of an electronics technician who works with Dr. Van Allen (discoverer of the Van Allen radiation belts). Other people who have been involved in use of the instrument are several biochemistry graduate students.

Dr. Dreyer offered a limited evaluation of Technical Support Packages, since he has used only one, but this one was "right on the money," except for the weight problems of the instrument.

WH:bs
5/16/69

Case Number: 81119615

The Beech Aircraft Corporation has been reviewing their present manufacturing techniques and processing manuals in light of an innovation developed at Ames Research Center. The innovation aids soldering of electronic components on circuit boards.

<u>Subject</u>	<u>Technology Source</u>
Beech Aircraft Corporation 9709 East Central Wichita, Kansas 67206 316-683-4681 Contact: J. P. Covey Purchasing Supervisor	Ames Research Center Tech Brief: 66-10162

Mr. J. P. Covey, a supervisor in the Estimating and Purchasing Department of the Beech Aircraft Corporation, learned of the Ames developed innovation through the Small Business Administration. Thinking that the innovation might improve manufacturing techniques employed by Beech Aircraft, Mr. Covey requested the Technical Support Package. About two to three hours were spent by the process manufacturing group in reviewing the NASA Technical Support Package and evaluating present techniques. Mr. Covey estimates that \$20 to \$30 was the extent of incurred costs. After reviewing present manufacturing techniques and processing manuals, the process manufacturing group technicians concluded that no changes were necessary in present techniques. The Technical Support Package was then disseminated to other departments at Beech for their evaluation.

Although Mr. Covey does not receive NASA publications, he felt that the engineering tech group at the plant might receive them. Mr. Covey stated that although he was not a technical person, he felt that NASA publications were "fairly explanatory and generally clear."

TM:ag
6/6/69

Case Number: 80815485

The P. J. Palanek Engineering Company, Valley Stream, New York has adapted a soldering iron temperature regulator, developed at Ames Research Center, for use on a subcontracting project with the Grumman Aircraft Engineering Corporation.

<u>Subject</u>	<u>Technology Source</u>
P. J. Palanek Engineering Company 16 Laurel Place Valley Stream, (L.I.) New York 11580 516-CU5-6469 Contact: Paul J. Palanek	Ames Research Center Tech Brief: 66-10203

The P. J. Palanek Engineering Company, a small, three engineer firm, is engaged in specialized subcontracting work, primarily with the Grumman Aircraft Engineering Corporation. The firm handles such projects as the construction of wind tunnel models, and has performed subcontract work for Grumman on the NASA Lunar Module (LM).

On one particular project Grumman specifically recommended the subject Tech Brief to Mr. Palanek, giving him a copy of an aerospace magazine containing a description of this brief. Mr. Palanek stated that his firm was able to modify the soldering iron temperature regulator and adapt it to their need for soldering and fusion of mechanical components. According to Mr. Palanek, his engineers spent between 20 and 40 hours in developing a usable mechanism. The net savings in research time to the firm was estimated at a few hundred dollars. Mr. Palanek said that the developed mechanism was applicable to the present project only and no patent, waver, or license was involved.

Although the P. J. Palanek Engineering Company does not regularly receive NASA publications, Mr. Palanek felt that the material he obtained has been informative, and the enclosed drawings of high quality. He stated that he holds a "very favorable" opinion of NASA publications.

TM:ag
6/25/69

Case Number: 80815599

Lakeside Tool & Machine, Muskego, Wisconsin, is adapting a flexible-drive design developed for welding to a new nozzle system for automatic dishwashers to clean Melmac plastic dinnerware.

<u>Subject</u>	<u>Technology Source</u>
Lakeside Tool & Machine W. 180 S. 7767 Racine Avenue Muskego, Wisconsin 53150 414-679-0910 Contact: Richard Maurice	Manned Spacecraft Center Tech Brief: 66-10428

Under contract with a Chicago firm, a small tool and machine manufacturer is developing a new system of nozzles for automatic dishwashers for Melmac dinnerware.

A flexible-drive system for welding and machining in confined areas was developed by D. E. Harvey and R. G. Rohrberg of North American Aviation. The Technical Support Package describing the tool was requested for Lakeside Tool & Machine by the Milwaukee office of the Small Business Administration. Mr. Maurice of Lakeside reported that it was not immediately useful, but became quite valuable when he received the nozzle development contract. Eventually, the value of the Technical Support Package will be quite significant, but the project is too new to allow assessment of the relative importance of the various inputs.

Mr. Maurice's knowledge of Tech Briefs and Technical Support Packages comes from notices in trade publications and the Small Business Administration. He was unaware of the Cumulative Indexes and did not know about the Tech Brief subscriptions.

Concerning the quality of Technical Support Packages, Mr. Maurice remarked that some are ". . . too tough for the ordinary person, but on the whole they're pretty good."

WH:ml
5/20/69

Case Number: 90324004

The Dudley Hughes Ambulance Service investigated the possibility of using a spray-on electrode technique for monitoring electrocardiograms (ECG), an innovation developed at the Flight Research Center.

<u>Subject</u>	<u>Technology Source</u>
Dudley Hughes Ambulance Service 400 East Jefferson Dallas, Texas 75220 214-946-5133 Contact: Ray Le Pere General Manager	Flight Research Center Tech Brief: 66-10649

The Dudley Hughes Ambulance Service is a privately owned firm serving Dallas and its environs, employing a staff of 30 people operating 12 individual units. Mr. Ray Le Pere, the general manager of the company, learned of the ECG monitoring technique through a trade press, Ambulance Association Journal. Mr. Le Pere spent about two weeks in reviewing the Technical Support Package and considered the possibility of developing a commercial product. However, after discussing the product possibilities with an engineer, Mr. Le Pere is questioning the feasibility of such development.

This was Mr. Le Pere's first contact with NASA publications, and when he finally received the Technical Support Package he was quite pleased with its contents. It seems that the article in the trade press describing the Tech Brief did not give sufficient information to the reader, and thus Mr. Le Pere experienced a great deal of difficulty in contacting the appropriate agency to request the Technical Support Package. Presently Mr. Le Pere is thinking of developing a telemetry device to monitor the patient's heart beat while enroute to the hospital. He stated that if he were to come up with a workable idea for such a system, a local heart surgeon had said that he would obtain a "sizable grant from the Federal Government" to develop such a system. During our telephone conversation with Mr. Le Pere, we mentioned that there were several Tech Briefs available from NASA referring to the general area of cardiograph telemetry. We also sent Mr. Le Pere a brief letter describing the procedure for obtaining this information, i.e., the Clearinghouse service.

Case Number: 90324004 (Cont.) .

Mr. Le Pere was quite pleased with the Technical Support Package he had received, and was favorably impressed with the NASA information dissemination program.

TM:ag
7/7/69

Case Number: 80916070

The Audio Visual Department of the J. C. Penney Company, New York City is trying to adapt a NASA developed slide rule-type color chart to their work in motion pictures and television.

<u>Subject</u>	<u>Technology Source</u>
J. C. Penney Company, Incorporated 1301 Avenue of the Americas New York, New York 10019 212-957-7542	Manned Spacecraft Center
Contact: Mr. L. E. Waddington Audio Visual Consultant	Tech Brief: 66-10680

The Audio Visual Department of the J. C. Penney Company, among its other activities, produces films for the company for advertising, general information dissemination, and training purposes. According to Mr. Waddington, "standards for color slide and motion picture projection have not been firmly established by any society or formal group, although many approaches to the problem have been made." Mr. Waddington's interest in the field of color reproduction ranges from the prediction of color values for use in slide projection, all the way to standardization of "electronic color and saturation" in the color television field.

Mr. Waddington is not a regular recipient of NASA publications. He first learned of the color chart innovation developed at the Manned Spacecraft Center through a xerox copy of the Tech Brief which he received from friends in the film production field. The film producers, had in turn received the Tech Brief from friends in the Wright Irwin Aircraft Engine Company, who were regular recipients of Tech Briefs.

As of January, 1969 Mr. Waddington and his staff had expended over 80 hours in evaluating and applying the information contained in the Technical Support Package. Since that time considerably more hours have been spent on this project, and Mr. Waddington anticipates continuing development work. He feels that the best hope for achieving standardization in this industry lies with the various professional societies. He thinks that one society of which he is a member, the Society for Motion Picture and TV Engineers, would be one of the more appropriate societies for establishing standardization.

Case Number: 80916070 (Cont.)

Once standardization is achieved Mr. Waddington sees potential industry wide use of the slide rule-type color charts concept. It is difficult to put the Manned Spacecraft Center innovation in perspective when considering industry wide standardization for color reproduction. A movement towards standardization has been in progress for many years, and some innovation similar to the slide rule would most probably have been developed. However, Mr. Waddington did think that the NASA information is a significant contribution to this field. As Mr. Waddington further noted, "many people carry ideas in their heads, but someone must express the idea on paper before progress can begin."

TM:ag
7/7/69

Case Number: 81221324

Mr. Nikitas Alexandridis, UCLA doctoral candidate, has received a document from the Jet Propulsion Laboratory concerning digital computer processing of X-ray photos.

<u>Subject</u>	<u>Technology Source</u>
N. Alexandridis, Student UCLA Computer Sciences Boelter Hall Los Angeles, California 213-825-1649	Jet Propulsion Laboratory
Contact: N. Alexandridis Doctoral Candidate	Tech Brief: 67-10005

Mr. Alexandridis, on a student visa from Greece, is presently doing his Ph. D. dissertation at UCLA. As an electrical engineer specializing in computer sciences, Mr. Alexandridis selected the area of pattern recognition as applied to chromosome analysis for his dissertation.

Based upon a defined need, the Jet Propulsion Laboratory was contacted by Mr. Alexandridis' advisor for information regarding scanning and digitizing of data as related to his research in digital processing of photos of chromosomes. According to Mr. Alexandridis, the Jet Propulsion Laboratory people and the documents received have been helpful and will contribute intangible benefits toward his research. They will also be used as reference materials in his dissertation along with other published papers. In his research, Mr. Alexandridis has been submitting photos to the Jet Propulsion Laboratory for conversion to "canned" digital data. Mr. Alexandridis then performs pattern recognition from the data by utilizing computers available to him at UCLA.

This was Mr. Alexandridis' first experience with NASA publications and he said they were "quite interesting." He felt that they were written at the "right level" in terms of technical content and explanation. However, Mr. Alexandridis also felt they could provide more of a bibliography which would be helpful to people doing research like himself.

RB:bs
7/11/69

Case Number: 81119765

The Clevite Corporation, Cleveland, Ohio plans to utilize a high temperature lubricant developed by the Lewis Research Center. This material would be used in a new bearing design being developed for turbines.

<u>Subject</u>	<u>Technology Source</u>
Clevite Corporation	Lewis Research Center
Mechanical Research Division	
540 East 105th Street	Tech Brief: 67-10007
Cleveland, Ohio 44108	
216-851-5500	
Contact: LeRoy Owen, Jr.	
Metallurgist	

The Clevite Corporation, as a primary engine bearing manufacture for the automobile industry, has recognized a need for a new bearing designed for truck and aircraft turbines. This new bearing design requires a high temperature lubricant which will replace the use of carbon materials presently used in turbines. According to Mr. Owen, the engineers at Clevite Corporation think that the material composition developed by NASA will satisfy their requirements. As a product, this new bearing design with the high temperature lubricant could be significant since it will simplify turbine designs and create more efficiency in the turbines.

At the present time, the sales potential of this product is nebulous since the general attitude of turbine designers must be changed before it will be readily accepted. Mr. Owen advised that they have expended approximately \$20,000 for labor and material in testing the high temperature lubricant developed by NASA. However, he thinks they saved about \$75,000 to \$100,000 in development costs and approximately one year in development time since the needed technology was available to them through NASA, other general sources in the field, and their own internal development activities. It is expected that the new bearing design developed at Clevite will be regarded as proprietary technology rather than a patented item.

The Clevite Corporation's Mechanical Research Division regularly receives NASA publications which are filed and catalogued by their library. Internally, Tech Briefs are routed to people and groups who

Case Number: 81119765 (Cont.)

are known to have an interest. Mr. Owen regularly receives the Tech Briefs and he has been quite "satisfied" with what he has received. "The information desired" (in the Technical Support Package on the high temperature lubricant) "was certainly there and available for use," according to Mr. Owen.

RB:ag
7/15/69

Case Number: 81017540

The G. T. Schjedahl Company, Northfield, Minnesota is evaluating a switching technique developed at the Ames Research Center.

<u>Subject</u>	<u>Technology Source</u>
G. T. Schjedahl Company Highway 3 North Northfield, Minnesota 55057 507-645-5633	Ames Research Center
Contact: George L. Freeman President	Tech Brief: 67-10135

The G. T. Schjedahl Company is an aerospace systems firm and was one of the prime contractors for the Echo Satellite program. The company is presently doing research in the fields of memory storage and switching techniques, and data display techniques for computer terminals.

According to the president of this company, Mr. George L. Freeman, the firm is presently engaged in proprietary development work on a flat TV display tube. Rather than using the standard electron tube, the firm is investigating an electro-luminescence principle. A major problem in this process concerns the development of adequate switching techniques. One of many methods currently under investigation by the firm is an integrator which can easily be set and reset with an electronic switch developed at the Ames Research Center. Mr. Freeman stated that at present he was unable to evaluate the importance of the Ames innovation, but that in about six months sufficient evaluation of various potential switching techniques will have been completed and he will better be able to evaluate the importance of this innovation to the Schjedahl Company's overall project. Mr. Freeman emphasized that this flat TV project is "strictly in the development stage."

The G. T. Schjedahl Company is a regular recipient of NASA publications, but Mr. Freeman stated that he himself is not a regular recipient. According to Mr. Freeman the information on the Tech Brief in question "must have come across (his) desk." He obtained the Technical Support Package through the Small Business Administration, and he suggested that NASA publish some type of summary report which would

Case Number: 81017540 (Cont.)

be distributed to "top management people." According to Mr. Freeman, this service would keep top management people abreast of developments in their respective fields.

TM:ag
7/3/69

Case Number: 80610430

The Hazeltine Corporation has incorporated portions of the Workmanship Standards for Fusion Welding developed at Space Nuclear Propulsion Office into their Workman Quality Handbook.

<u>Subject</u>	<u>Technology Source</u>
Hazeltine Corporation 59-25 Little Neck Parkway Little Neck, New York 11362 212-321-2300 Contact: Kenneth LeSesne Q. A. Engineer	Space Nuclear Propulsion Office Tech Brief: 67-10200

Kenneth LeSesne has included applicable portions of the Workmanship Standards for Fusion Welding into the revision of his company's Workman Quality Handbook. Mr. LeSesne stated that the NASA data contributed about 1% of the new handbook.

The Hazeltine Corporation deals primarily in military and NASA contracts. They produce radar systems for military agencies. Mr. LeSesne reported that more than 80 hours was spent comparing the Technical Support Package information with military specification requirements. They wanted to pick out the most rigid aspects of both specifications to put into their own manual since they do both military and NASA work. Receipt of the NASA welding standard was quite timely for insuring the inclusiveness of their publication and compliance with NASA standards. The NASA innovation is product related only insofar as it contributes to inspection of the product; production and inspection personnel will utilize the finished manual. Mr. LeSesne said, "I was very pleased with the Technical Support Package and quite surprised at the depth of the coverage provided. I have every intention of availing myself of other technical support offerings."

He believed that receiving this NASA welding standard improved their production efficiency and saved development time and money, but these are two items that are relatively difficult to quantify. Their company library subscribes to Tech Briefs.

AV:ag
6/10/69

Case Number: 80202216

The M. W. Kellogg Company of New York City has investigated several uses of the Workmanship Manual for Welding developed at the AEC-NASA Space Nuclear Propulsion Office.

<u>Subject</u>	<u>Technology Source</u>
The M. W. Kellogg Company 711 Third Avenue New York, New York 10017 212-697-5200	AEC-NASA Space Nuclear Propulsion Office
Contact: Charles H. Voelker Chief Welding Engineer	Tech Brief: 67-10200

The M. W. Kellogg Company is a division of Pullman, Incorporated and is a complete engineering, materials procurement, and construction service for industrial processing plants, oil refineries, and chemical plants.

Mr. Charles H. Voelker, Chief Welding Engineer for the firm, obtained a copy of Workmanship Manual for Welding about two years ago. Since that time, the company has instituted an educational program to increase the welding knowledge of their employees and to upgrade their professional competence by in-service training. The welding manual is a primary reference for this educational program.

Another project referred to by Mr. Voelker involves an effort to raise the standards of present welding codes. He hopes to upgrade the visual examination process of welds so that they parallel present radiographic standards. He knows of only two documents that provide a visual presentation of actual welds, and considers the NASA publication on welding a prime basis for initiating changes in the present welding codes. According to Mr. Voelker, the American Society of Non-Destructive Testing is attempting to incorporate the visual inspection of welds into a TCL-A classification, a type of job classification. He also mentioned a leak testing handbook published through NASA and considered this handbook the "only professional handbook on the subject."

Mr. Voelker is a regular recipient of NASA publications. Relevant publications are disseminated to other members in his group and then

Case Number: 80202216 (Cont.)

stored in a localized library. The M. W. Kellogg Company maintains a research library which receives NASA publications. Mr. Voelker did not know if his company was an RDC subscriber.

TM:ag
6/26/69

Case Number: 90628862

The Department of Mechanical Sciences and Environmental Engineering of the University of Denver is making use of a Trans World Airline developed project management technique called Vis-A-Plan as a schedule monitoring device for a unique student-faculty project involved with the exploitation of NASA-developed patents.

<u>Subject</u>	<u>Technology Source</u>
University of Denver Denver, Colorado 80210 303-753-2891	Kennedy Space Center
Contact: Dr. Arthur A. Ezra Department Chairman Mechanical Sciences & Environmental Engineering	Tech Brief: 67-10240

The Department of Mechanical Sciences and Environmental Engineering of the University of Denver, under the direction of Dr. Arthur Ezra, is working under NASA sponsorship to develop effective ways of exploiting unused NASA patents. The present thrust of the program is concerned with a multidisciplinary effort involving students, faculty, and research engineers in evaluating patents, developing prototypes, performing a market research and introducing a new safety related product based on a NASA energy-absorbing patent.

The patent exploitation project includes the Colleges of Engineering, Business, Law, and Arts and Sciences, as well as the Research Institute of the University of Denver. An undertaking such as this is a major departure from typical academic endeavors; thus the coordination is extremely critical to its success.

One of Dr. Ezra's staff members was reviewing NASA documents and came across the Vis-A-Plan Tech Brief. The information was given to two graduate students in Business Administration and two undergraduates in Civil Engineering. These students, charged with developing a meaningful schedule for the project, had been attempting to use a full-scale PERT system. However, when they were introduced to the Vis-A-Plan, they immediately discarded the PERT system in favor of the simplified and totally graphic approach.

Case Number: 90628862 (Cont.)

Because of the unique nature of the venture and the diverse backgrounds of the persons involved, maintaining schedule dates has been a major problem. The use of Vis-A-Plan has been extremely helpful in minimizing this problem.

RH:ag
6/26/69

Case Number: 81018080

The New York Stock Exchange, New York City considered adopting the "Vis-A-Plan" management technique developed by Mr. Nathan H. Ranck of Trans-World Air Lines under contract to the Kennedy Space Center.

<u>Subject</u>	<u>Technology Source</u>
New York Stock Exchange Eleven Wall Street New York, New York 10005 212-623-3000 Contact: George Eckert Manager, Real Time Systems	Kennedy Space Center Tech Brief: 67-10240

Mr. George Eckert, the former Manager of Real Time Systems at the New York Stock Exchange, had considered adopting the "Vis-A-Plan" management technique for monitoring an automation program at the Exchange. (Mr. Eckert had formerly worked with Mr. Nathan Ranck, the inventor of the "Vis-A-Plan" technique, while both were employed by Pan American.) When Mr. Eckert was given responsibility for developing a monitoring technique for the automation program at the New York Stock Exchange, he immediately contacted Mr. Ranck. At this time, Mr. Ranck was working for Trans-World Air Lines under contract to the Kennedy Space Center; he mentioned the Tech Brief and how to obtain the Technical Support Package.

Mr. Eckert and his staff at the New York Stock Exchange spent about 40 hours in evaluating the Technical Support Package and applying the information. However, the project became too complex for the Stock Exchange staff, and the entire program was turned over to the Federal Systems Division at IBM; IBM employed their own systems, and no further use was made of "Vis-A-Plan."

Since then, Mr. Eckert has left the New York Stock Exchange and is presently employed at Computer Sciences Corporation in New York City. The present Manager of Real Time Systems at the New York Stock Exchange is a Mr. Frank Bordas. During the course of locating Mr. Eckert, we were able to speak with Mr. Bordas who stated that he knew nothing about any plans to adopt the "Vis-A-Plan" management technique.

Case Number: 81018080 (Cont.)

Mr. Eckert considered the quality of the NASA Technical Support Package very good. He stated that the documentation of the technique allowed full understanding for employees at the Exchange who were not familiar with the "Vis-A-Plan." Mr. Eckert also thought that the "quality and presentability" of the Technical Support Package helped him in his efforts to institute the technique within the Exchange.

TM:ag
7/3/69

Case Number: 90323570

Smith & Loveless, a division of Union Tank Car Company, Lenexa, Kansas has reviewed a document from Kennedy Space Center on Vis-A-Plan and they are implementing this management control technique on a limited basis.

<u>Subject</u>	<u>Technology Source</u>
Smith & Loveless	Kennedy Space Center
Division-Union Tank Car Company	
Lenexa, Kansas 66215	Tech Brief: 67-10240
913-Tuxedo 8-5201	
Contact: J. B. Clarke	
Secretary-Treasurer	

Smith & Loveless, a manufacturer of sewage treatment and pumping equipment is in the process of revising their inventory and production control systems in order to establish more effective management control and visibility. As part of this effort the company has employed consultants to recommend systems and techniques which might be implemented. Also, they received the Technical Support Package on Vis-A-Plan and have implemented this technique on certain non-recurring situations in the areas of new product development.

Mr. Clarke, Secretary-Treasurer at Smith & Loveless, became aware of Vis-A-Plan through the NASA Tech Brief. He stated that they are very interested in this technique as "an effective non-computerized method." However, at the present time in their production areas, they are implementing a modified Gantt Chart and Critical Path Method (CMP) approach. Although the use of Vis-A-Plan is limited at this time, Mr. Clarke feels that they may expand its use at a later date into their production areas. Approximately 65 hours have been expended to date on Vis-A-Plan at Smith & Loveless. Mr. Clarke did not think he could identify any tangible savings, but he stated that intangible benefits can be derived since "the area of planning and scheduling would be more effective in terms of management control and insight."

Case Number: 90323570 (Cont.)

NASA publications are received regularly at Smith & Loveless by the research department. They are circulated to persons who might be interested and then they are maintained on file. Company personnel think that generally NASA publications are good.

RB:ml
7/11/69

Case Number: 80916485

The Electron Tube Division of the International Telephone and Telegraph Company (ITT) has investigated the possibilities of adopting a process for water cooling the anode in their xenon lamps. The water cooling process was developed at the Jet Propulsion Laboratory.

<u>Subject</u>	<u>Technology Source</u>
International Telephone and Telegraph Company Electron Tube Division Box 100 Easton, Pennsylvania 18043 215-252-7331 Contact: James Malloy Engineering Manager	Jet Propulsion Laboratory Tech Brief: 67-10247

The Electron Tube Division of ITT had four active product lines, one of which is the development and production of a 20 kilowatt xenon lamp for use in U.S. Army searchlights. Mr. James Malloy, the Engineering Manager for the xenon lamp group, learned of the NASA innovation at a xenon lamp committee meeting sponsored by NASA and held at the Jet Propulsion Laboratory in 1967. Roughly one hour was spent by the xenon lamp group in reviewing the Technical Support Package, but it was found that the innovation is not applicable to work currently undertaken.

The Jet Propulsion Laboratory has used this innovation in solar simulation experiments. The innovation must be employed in a fixed system where a constant water supply and regulatory system is available. According to Mr. Malloy, the Army uses the searchlights manufactured by the Electron Tube Division under tactical situations. Under such a situation, it is possible that power may be lost for a short duration of time; and loss of power would stop the flow of water, and a high probability of burning out the searchlight would result. The Army decided in favor of a searchlight with a shorter life, which is more reliable in a tactical situation.

The Electron Tube Division of ITT is a regular recipient of NASA publications. The publications are disseminated by two secretaries who are in charge of the library, publications being disseminated along

Case Number: 80916485 (Cont.)

product lines. Each month a list of the available Tech Briefs are routed to managers and engineers of the firm.

Mr. Malloy feels that some of the NASA publications are sketchy, some go overboard, but generally they are "down the middle of the road." The Electron Tube Division is not an RDC subscriber, but Mr. Malloy stated that he was aware of the existence and function of the RDC's.

TM:ag
7/23/69

Case Number: 80709122

The Precision Fastener Division of the Standard Pressed Steel Company is developing an ultrasonic wrench using information supplied by Marshall Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Standard Pressed Steel Company Precision Fastener Division Jenkintown, Pennsylvania 19046 215-TU-4-7300 Contact: Glenn R. Willey Project Engineer Product Development Engineering	Marshall Space Flight Center Tech Brief: 67-10353

The Precision Fastener Division of the Standard Pressed Steel Company employs over 3,000 persons manufacturing precision fasteners for industrial and aerospace uses. According to Glenn Willey, project engineer in the product development engineering department, the division needed some means for creating an accurate preload and more repeatable induced loads in bolted joints.

Mr. Willey learned of the ultrasonic wrench developed at Marshall Space Flight Center through a NASA Tech Brief. Thus far, 12 hours have been expended by members of the product development department in evaluating the Tech Brief, and additional time has been expended in management review. Mr. Willey stated that further development of a commercially marketable ultrasonic wrench awaits the go ahead from management. Personnel involved in the development of the wrench will include two engineers and several model builders from the product development department. Such a product is expected to find application in the aircraft field. Although Mr. Willey is not a regular recipient of NASA publications, members of management of the division are recipients. Mr. Willey felt that the NASA Tech Brief provided all the information the firm needed for the development of the ultrasonic wrench, and that the information pointed out the potential for other similar developments.

TM:ag
6/16/69

Case Number: 80815200

The Glass Research Center of the Pittsburgh Plate Glass Company is evaluating a machining process for plastic sections which was developed at the Marshall Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Pittsburgh Plate Glass Company Glass Research Center Pittsburgh, Pennsylvania 15238 412-362-5100	Marshall Space Flight Center
Contact: George Zibritosky Research Engineer	Tech Brief: 67-10381

The PPG industries provide transparencies to the automotive and aircraft industries manufactured from plastics, glass, and their combination. At present one project of the Glass Research Center concerns the fabrication of aircraft transparencies for use as windshields and canopies. Mr. George Zibritosky, a research engineer at the Glass Research Center, learned of the innovation developed at the Marshall Space Flight Center through a professional journal; although he was not sure, he believed that the journal was Design News.

Less than an hour has been expended by members of the firm in reviewing the Technical Support Package, but according to Mr. Zibritosky, the firm plans tests to evaluate and hopefully improve the process described. If the evaluation procedure produces promising results, PPG will incorporate the machining procedure into their fabrication process. At present Mr. Zibritosky stated that he was unable to evaluate the potential savings and benefits deriving from the NASA publication.

Mr. Zibritosky is not a regular recipient of NASA publications, and he did not know of any program at the Glass Research Center which received or disseminated such publications. He mentioned that the company library did receive the Index to the NASA Tech Briefs and he had consulted this index on several occasions. Mr. Zibritosky spoke favorably of the Technical Support Packages and considered NASA information "one of the better publications," relevant to his work.

TM:ag
6/27/69

Case Number: 80815430

Mr. Jack Berry of the Burroughs Corporation used a NASA Technical Support Package to support the practicality of his use of anodized aluminum as a heat sink for multiple transistors.

<u>Subject</u>	<u>Technology Source</u>
Burroughs Corporation 41100 Plymouth Road Plymouth, Michigan 48170 313-433-1400	Marshall Space Flight Center
Contact: Mr. Jack Berry Senior Design Engineer	Tech Brief: 67-10425

Mr. Berry was working on a method of making a heat sink out of a single piece of anodized aluminum for a multiplicity of transistors. These transistors were at different potentials and had to be insulated from one another. The practicality of his methods was being questioned and doubted by his associates. The work done at Marshall Space Flight Center on anodized aluminum printed circuit boards supported his work and quieted his doubters.

The NASA Tech Brief information dealt primarily with the study of anodized aluminum for use as circuit boards. Mr. Berry expanded upon this idea in using the anodized aluminum as a common heat sink for a multiplicity of transistors or diodes. Mr. Berry said "from a cost standpoint, this method should considerably reduce the cost of putting a multiplicity of semiconductors on a single heat conducting element." The anodized aluminum heat sink is not in full production as yet, but the idea is going to be used by the Burroughs Corporation. Mr. Berry's opinion is that the Tech Brief program is "very good" and that the research presented is "quite qualified." He feels that "Tech Briefs are the only place in the country we can get technology without doing it ourselves."

AV:lj
7/22/69

Case Number: 80708411

Systems Analysts at General Precision System, Wayne, New Jersey, evaluated a conceptual nonorthogonal gyro configuration described in a Manned Spacecraft Center Tech Brief, but have not developed an application.

<u>Subject</u>	<u>Technology Source</u>
General Precision System 150 Totowa Road Wayne, New Jersey 07470 201-256-4000, Ext. 351 Contact: Douglas P. Dallio Systems Analyst	Manned Spacecraft Center Tech Brief: 67-10433

General Precision System personnel have evaluated a NASA Technical Support Package which describes a new gyro system for guidance and navigation. The Technical Support Package is a conceptual document, and no models or prototypes are available. The firm was developing a subcontract proposal for a guidance system; the Tech Brief suggested a novel design that was thought to be potentially useful in the proposed system. About 40 manhours were devoted to analysis and experimentation related to the Technical Support Package; however, actual development of the gyro system was not carried forward since the firm did not acquire the subcontract. The idea has been dormant, since there has been no market for the developed product.

According to D. P. Dallio, Systems Analyst, the Technical Support Package provided a unique source of information and, as such, provided nearly all the information used in the proposal.

General Precision System is a Tech Brief subscriber. The documents are located in a central library which circulates a list of new accessions to R & D personnel and the first level of engineering management.

WH:ag
5/21/69

Case Number: 80815730

The Cosmodyne Corporation, Torrance, California has reviewed a Fluid Properties Handbook which was compiled at the Marshall Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
The Cosmodyne Corporation 2920 Columbia Street Torrance, California 90509 213-775-6881	Marshall Space Flight Center
Contact: Mrs. Campbell, Secretary to Mr. Woods, Division Manager	Tech Brief: 67-10440

Mr. Homer C. Rowe, a customer service engineer with the Cosmodyne Corporation, requested the Fluid Properties Handbook from the Marshall Space Flight Center. In his questionnaire Mr. Rowe stated, that, "(The handbook) would have been of greater value except that Cosmodyne had developed an almost identical fluid properties handbook independently." He went on to state that there are a few graphs which are not included in the Cosmodyne handbook which may be helpful, but overall the Technical Support Package proved of limited value to his work. In addition, he mentioned on the questionnaire that, "These charts and graphs were used for reference by myself and one other instructor in teaching operation, theory and maintenance of the Cosmodyne GB-1A LN²/LO² Liquefier." He stated that approximately ten hours were spent in reviewing this information.

Mr. Rowe learned of the Marshall Space Flight Center Handbook through Design News. He thought that the completeness and clarity of the Technical Support Package was excellent and the usefulness, good. No other information was available from the questionnaire.

In attempting to contact Mr. Rowe, we spoke with Mrs. Campbell, a secretary to a Mr. Woods, manager of the division in which Mr. Rowe works. Mrs. Campbell stated that Mr. Rowe is currently under contract with the United States Marine Corps at the El Torro Marine Base, and will not be available until June 1970. Mrs. Campbell stated that Mr. Rowe had left message that he was currently using the Marshall Fluid Properties Handbook in this training program with the Marine Corps and

Case Number: 80815730 (Cont.)

found it of great value. According to Mrs. Campbell, it is impossible to contact Mr. Rowe, and no other information was available from the Cosmodyne Corporation.

TM:ag
7/15/69

Case Number: 80815745

In evaluating various types of strain gauges, the McDonnell-Douglas Corporation received help from data contained in the Fluid Properties Handbook. The specific fluid involved in the tests was liquid helium.

<u>Subject</u>	<u>Technology Source</u>
McDonnell-Douglas Corporation Structural/Mechanical Department 5301 Bolsa Avenue Huntington Beach, California 92646 714-987-0311 Ext. 2579 Contact: Francis S. Torigoe Structural Test Engineer	Marshall Space Flight Center Tech Brief: 67-10440

Francis Torigoe is a part of a group involved in design-related testing of structural components, using various fluids including liquid helium and hydrogen. Torigoe ordered the Fluid Properties Handbook, and spend approximately 20 hours studying it, in order to learn more about the properties of the fluids being used for testing. Torigoe said that in connection with his work it is essential to be as familiar as possible with the fluid properties.

Torigoe said that his use of the handbook was severely limited by the poor quality of reproduction. He said the book is a conglomeration of curves which might have been more valuable if he had been able to interpret the results.

Torigoe is not a regular recipient of any NASA publications. Occasionally he does hear about a Tech Brief from a colleague. He was not familiar with STAR or IAA. Torigoe relies primarily on trade and professional publications for his scientific and technical information.

DCC:ag
6/24/69

Case Number: 80916765

The Electronics and Communications Division of the Atlantic Research Corporation, Alexandria, Virginia considered adoption of an oscillator circuit which operates as a digitally controlled frequency synthesizer, an innovation developed at the Goddard Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Atlantic Research Corporation Electronics and Communications Division Shirley Highway at Edsall Road Alexandria, Virginia 22314 703-354-2400 Contact: Boyd E. McClure Laboratory Chief	Goddard Space Flight Center Tech Brief: 67-10447

The Electronics and Communications Division, Jansky and Bailey Engineering Department of the Atlantic Research Corporation is working on many types of digital systems for data collection and processing. Mr. McClure, a laboratory technician at the firm, came across a reference to this Tech Brief in an article by Robert Hartley in the July 1968 issue of Electronics Products. Mr. McClure had been working on a discrete frequency synthesizer and felt that the Tech Brief might be applicable to his work. About 25 hours were spent in reviewing the information by Mr. McClure and several members of the department; after this evaluation of the Technical Support Package, it was thought that the information supplied was not directly applicable to the work being done at the firm. However, Mr. McClure did state that since then he has had an opportunity to use some of the decoding techniques described in the Technical Support Package.

The company is a regular recipient of NASA publications, and there is an internal system for distribution. Mr. McClure could supply no detailed information regarding Atlantic's dissemination and storage of NASA supplied publications. He stated that he used to receive NASA Tech Briefs as a "fallout" from a person who was on the

Case Number: 80916765 (Cont.)

distribution list within the company. This person has since left the firm, and Mr. McClure no longer receives this information; he says that he "kind of misses them (the Tech Briefs)."

TM:ag
6/26/69

Case Number: 80815375

The Power Generation Division of the General Electric Company, Schenectady, New York investigated a microwave surface-crack detection method developed by Ames Research Center.

<u>Subject</u>	<u>Technology Source</u>
General Electric Company Power Generation Division One River Road Schenectady, New York 12305 518-374-2211 Contact: Dr. R. M. Goldhoff Manager	Ames Research Center Tech Brief: 67-10482

The Materials and Processes Laboratory, Power Generation Division, of the General Electric Company has been searching for a satisfactory method to measure complex metal strains at elevated temperatures. Dr. R. M. Goldhoff, manager of the Metallurgy Applied Research Group, stated that several methods of measurement had been attempted, including a strain gauge and split-beam laser.

Dr. Goldhoff noticed the microwave method mentioned in the June 17, 1968 issue of Steel Magazine. His group, including five engineers and six technicians and support people, spent approximately eight man-hours in reviewing the Technical Support Package. The results of the evaluation indicated that the microwave method for surface-crack detection in metals (developed at Ames Research Center) was not satisfactory for the group's present requirements. It was found that the microwave method reviewed was overly sensitive to temperature changes in the metal, and such changes invalidated meaningful strain measurements. No further use of the Ames innovation is planned by General Electric Materials and Processes Lab.

Dr. Goldhoff felt that the information he obtained had been useful. He is not a regular recipient of NASA publications and the company is not an RDC subscriber.

TM:ag
6/27/69

Case Number: 80708011

The refractory metals division of the General Electric Company, Cleveland, Ohio has adapted a room-temperature, curable, polyester casting resin for mounting metallographic samples. The testing of various epoxy and polyester resins for use as metallographic mounts was undertaken by the Argonne National Laboratory.

<u>Subject</u>	<u>Technology Source</u>
General Electric Company 21800 Tungsten Road Cleveland, Ohio 44117 216-266-2121 Contact: Sam Leber Supervisor	Argonne National Laboratory Tech Brief: 67-10484

Mr. Sam Leber, a supervisor at the refractory metals division of the General Electric Company stated that the process and recommendations provided in the Technical Support Package he received from the Argonne National Laboratory is saving General Electric approximately \$100.00 annually. More important however, according to Mr. Leber, are the technical benefits resulting from the use of the new resin. The mounting of metallographic samples is an everyday procedure at the refractory metals division, and the new resin and process described in the Technical Support Package have increased the accuracy and precision of sample analysis. About ten hours were spent in evaluating the Technical Support Package before the procedure was actually adopted.

Mr. Leber is a regular recipient of NASA publications, as are several other individuals within the division. Each individual recipient reviews the publications and disseminates relevant articles to appropriate persons within the division. The publications are stored in a company library.

Mr. Leber considered the Technical Support Package under question excellent. He stated that some information he had received through the NASA dissemination program had been sketchy, but he felt that overall the program was excellent. The division is an RDC subscriber, but Mr. Leber did not consider himself knowledgeable enough to evaluate the RDC method of information dissemination.

TM:ag
6/19/69

Case Number: 80916218

The Ball Brothers Research Corporation, Boulder, Colorado has adopted a process developed at the Marshall Space Flight Center for the quality control of monolithic circuits.

<u>Subject</u>	<u>Technology Source</u>
Ball Brothers Research Corporation Box 1062 Boulder, Colorado 80302 303-444-5300	Marshall Space Flight Center Tech Brief: 67-10507
Contact: Kenneth E. Steiner Supervisor, Quality Engineering	

Ball Brothers Research Corporation is working in the area of aerospace systems under a NASA contract; the firm is concerned also with commercial television systems. Mr. Kenneth Steiner, supervisor for quality engineering at this firm, said that the processes described in the referenced Technical Support Package from Marshall Space Flight Center have been adopted by Ball Brothers; he estimated that this NASA information has resulted in at least a \$6,000 savings to the firm. If the information had not been available in this manner, it would have been necessary for an engineer in the quality control division and one in the reliability division to make at least three trips to various research laboratories doing research in this field to gather appropriate data. As Mr. Steiner pointed out, this latter procedure would assume that the Ball Brothers' engineers actually could obtain such needed information from the firms visited. Ball Brothers Research Corporation devoted at least 80 man-hours to reviewing the information supplied and in adopting the process.

As a NASA contractor, Ball Brothers Research Corporation regularly receives NASA publications. These publications are automatically stored in the company library; each month the library circulates a list of publications available within the library. Mr. Steiner stated his concern that there is an overly long delay in ordering publications through the company library, and he feels that he can obtain much quicker service by ordering directly from NASA, so he does so at his own expense. By ordering at his own expense, he can retain the documents received, a benefit which Mr. Steiner greatly appreciates.

Case Number: 80916218 (Cont.)

According to Mr. Steiner, it is imperative that his firm have access to all publications pertaining to quality control of integrated circuits. He thinks that one of the best sources for obtaining up-to-date information on recent publications is the monthly catalog, United States Government Publications. He uses this "green book" and also talks with vendors and customers of the firm to keep informed about recent publications in the field.

Ball Brothers is an RDC subscriber, but Mr. Steiner does not feel he is knowledgeable enough to evaluate the RDC effort. He considers the NASA publications to be of excellent quality, and especially appreciates the form in which the title appears on the Tech Brief. He thinks that in most cases the title tells him more than the summary within the Tech Brief.

TM:ag
6/24/69

Case Number: 81017915

Latrobe Die Casting Company recommends to its customers a technique developed at NASA's Lewis Research Center for coating magnesium with plastic.

<u>Subject</u>	<u>Technology Source</u>
Latrobe Die Casting Company	Lewis Research Center
P. O. Box 149	
Latrobe, Pennsylvania 15650	Tech Brief: 67-10584
Contact: William Bowman	
Manager Research	

T. S. Mroz of Lewis Research Center developed a cleaning process and a fogging technique to facilitate application of plastic coating to magnesium plates. Mr. William Bowman of Latrobe Die Casting Company learned of the innovation as a member of the Technical Committee of the American Die Casting Institute. This committee reviews a variety of literature dealing with technology in the die casting industry, and circulates copies of Tech Briefs and other material to all member firms. One member of this committee (Robert Cornell of Newton New Haven Die Casting Company, Newton, Massachusetts) receives Tech Brief subscriptions, and he provides the full committee membership with documents relevant to die casting which they evaluate for industry-wide dissemination. In addition, according to Mr. Bowman, the Institute has received valuable direct technical assistance and advice from two NASA employees, Bob Johnson and Stan Mansen.

The plastic coating technique has not been used by Mr. Bowman's firm, which is a relatively small job-shop. The firm manufactures custom-made die castings for a variety of customers and delivers them in unfinished condition. The buyer then performs the tasks of final machining and finishing and applies a desired coating or plating. Conventional practice is to plate the castings. The best finishes are those which achieve a chemical bond with the surface of the casting, so paint is seldom used. The new plastic coating technique has worked well, according to customers who have applied it to castings purchased from Latrobe Die Casting. Mr. Bowman thought that the method is susceptible to wide use, but this depends upon the reaction of purchasers of die castings rather than upon the manufacturers of the castings. Mr. Bowman recommends the technique to customers whenever it appears to be adaptable to their needs, and stresses that this process is less expensive than the common anodine method.

Case Number: 81017915 (Cont.)

Mr. Bowman's firm has not realized any savings or increased revenues from this invention, since it is not used by them. However, the one hour of study of the Technical Support Package by Mr. Bowman and his recommending it to customers has probably returned some intangible (goodwill) benefits to the firm.

Mr. Bowman has used several Tech Briefs in his work at Latrobe Die Casting Company. He noted that he would appreciate NASA's doing more work directly related to his industry's technology, but he is pleased with the TU program as it enables the private sector to benefit from space research. He called the TU program a "worthwhile expenditure of public funds."

Regarding the Tech Brief system, Mr. Bowman stated that the broad education and experience of members of the Technical Committee of the American Die Casting Institute enables them to work well and easily with the Tech Brief abstract format. There is enough information in the Tech Briefs to judge whether or not the inventions might be usable in the die casting industry.

WH:ng
5/22/69

Case Number: 80710789

The Dixon Corporation, Bristol, Rhode Island has reviewed a procedure developed at Lewis Research Center for replacing metal piston rings used in a low density gas environment, with fluorcarbon seals.

<u>Subject</u>	<u>Technology Source</u>
Dixon Corporation Bristol, Rhode Island 02809 401-253-7500 Contact: Saul Ricklin Executive Vice President	Lewis Research Center Tech Brief: 67-10591

The Dixon Corporation, a manufacturer of plastic products, employs over 300 persons. Mr. Saul Ricklin, the Executive Vice President of the company, stated that the firm was constantly looking for new applications for their products, and, when identified, these new applications were passed on to the firm's customers. The Lewis Center Technical Support Package was reviewed in the hope of finding some new application for plastic products.

The Dixon Corporation is a regular recipient of NASA publications. The publications are routed to about half a dozen key personnel in the firm, then stored in the company library. The Technical Support Package in question was sent to the engineering department where about five hours were given to its evaluation. According to Mr. Ricklin, no known innovation resulted from the information in the Brief.

The firm's primary interest in the NASA publications is to keep current with pertinent developments so they will be able to pass innovative ideas along to their customers. Mr. Ricklin considered this particular Technical Support Package complete, clear, and potentially very useful.

TM:ag
6/25/69

Case Number: 81120055

The Medical Division of the American Optical Corporation, Bedford, Massachusetts is developing an instrument to monitor certain functions of bedridden patients. The firm plans to incorporate a cardiotachometer, developed at Ames Research Center, into their "bedside monitor."

<u>Subject</u>	<u>Technology Source</u>
American Optical Corporation Medical Division Box 361 Crosby Drive Bedford, Massachusetts 01730 617-275-0500 Contact: Mr. Joseph K. Panico Manager, Electronics System	Ames Research Center Tech Brief: 67-10598

The Medical Division of the American Optical Corporation manufactures various instruments used in the patient care field. Mr. Joseph Panico, Manager, Electronics System, Product Development and Engineering Department learned about the cardiotachometer from the September, 1968 issue of Medical Electronics News. After devoting about five hours to studying the Technical Support Package, department engineers decided that the low cost integrated circuits of the cardiotachometer were well suited to their needs. Mr. Panico estimates that the information contained in the NASA Tech Brief has saved the company over two months in development time.

According to Mr. Panico, the project is presently "in limbo," but continued development is anticipated. He envisions the industry-wide market for such a product to be 3,000 to 4,000 customers, and each unit is expected to be priced between \$1,600 and \$2,000.

Mr. Panico stated that he was not familiar with any other NASA publications, but considered the information on the cardiotachometer very clear, complete, and of great value in his work.

TM:ag
6/6/69

Case Number: 80815150

A sales engineer employed by the American Chain and Cable Company studied a Langley Research Center Technical Support Package dealing with hanging-chain impact dampers while exploring a new market for chain products.

<u>Subject</u>	<u>Technology Source</u>
American Chain and Cable Company, Incorporated	Langley Research Center
American Chain Division 454 E. Princess Street York, Pennsylvania 17403 717-843-1538	Tech Brief: 68-10042
Contact: E. L. Krout Engineer, Technical Sales	

An article in Machine Design describing a method of using suspended chains to damp the oscillations in tall flexible structures stimulated E. L. Krout to request more information. His firm sells chain and cable, and he was intrigued by the possibility of developing a special type of chain for such applications. He studied the Technical Support Package for about four hours and constructed two experimental models to determine the need for special chain characteristics. This exploratory trial did not evidence any differing performance from use of different types of chain.

Mr. Krout was unable to understand how the system works because the mathematics were too esoteric for him. He sent the Technical Support Package to research personnel, who claimed to understand it. However, because of personnel shortages and the absence of a definable market, further development has been shelved. In the event that a market appears (especially a market for a special type of chain) the project will be revived.

American Chain and Cable Company has established no formal program or procedure for ensuring awareness of Tech Briefs. Mr. Krout constantly searches for new ideas that might increase sales and use

Case Number: 80815150 (Cont.)

of chain products, and this initial acquaintance with the Tech Brief program occurred accidentally as he skimmed Machine Design for sales leads.

WH:ml
5/19/69

Case Number: 81120100

The Department of Psychology at Baylor University is studying the effects of ionized and nonionized radiation on the central nervous system. Rhesus monkeys will be employed as subjects, and the department plans to use a multichannel implantable telemetry system developed at the Ames Research Center.

<u>Subject</u>	<u>Technology Source</u>
Baylor University	Ames Research Center
Department of Psychology	
Waco, Texas 76703	Tech Brief: 68-10065
Contact: William D. Thompson, Ph.D.	
Professor	

The Department of Psychology at Baylor University has undertaken studies of the central nervous system. The research team, made up of ten faculty members, four researchers and several graduate research assistants, had been looking for some means of monitoring the neurophysiological functioning of their experimental subjects. Professor Thompson, a regular recipient of NASA publications, noticed the multichannel implantable telemetry system in a NASA Tech Brief and felt such a device might be applicable to the research needs of the department.

After spending eight to ten hours and several hundred dollars evaluating the Technical Support Package, the research team concluded that the telemetry system offered the best solution to its needs. The team plans to proceed with their research project implanting the telemetry system in the Rhesus monkeys.

Professor Thompson, being a Department of Defense contractor, regularly receives NASA publications. The publications are stored in a jointly supported library run by the psychology and biology departments at Baylor University. Although there are no formal channels for circulation of the NASA publications, the library is open to all faculty, staff, and students at the University.

Professor Thompson felt that the quality of NASA publications was "very good," and he had no suggestions for improvement.

TM:ag
6/6/69

Case Number: 81017115

The Vought Aeronautics Division of the LTV Aerospace Corporation has reviewed a document from the Goddard Space Flight Center concerning the principles of optical-data processing techniques.

<u>Subject</u>	<u>Technology Source</u>
LTV Aerospace Corporation Vought Aeronautics Division P. O. Box 5907 Dallas, Texas 75222 214-266-3260 Contact: N. F. Bolling Engineering Scientist	Goddard Space Flight Center Tech Brief: 68-10069

According to Mr. Bolling, an engineering scientist in the research and development department, "Our particular group is engaged in instrumentation research and development for flight testing of the Vought Aeronautics Division's A 7-A, and E series of jet aircraft, VSTOL aircraft, weapons separation test programs, and other systems that will quite likely make use of optical-data processing for future data acquisition and reduction."

Mr. Bolling's specific tasks at Vought are oriented towards developing a monitoring system which will accurately determine the position and altitude of weapons from the time they are released from the plane until they are well removed. Mr. Bolling has been exploring all available methods of optical-data processing, and learned of the Goddard techniques through Modern Data Systems, June 1968, and also from reference to a new literature item in the optical journals. He felt that the information contained in the Technical Support Package increased his state-of-the-art knowledge on the subject, and gave the research group confidence that they had practically exhausted the available literature in the field. Approximately ten to twelve hours were spent reviewing the literature supplied. No other specific benefits were directly attributable to the information contained in the Technical Support Package.

Mr. Bolling is a regular recipient of "some" NASA publications. The library at Vought also receives NASA publications and issues a monthly bulletin of recent acquisitions. Regarding the NASA publications, Mr. Bolling said that "frequently information is well presented, but

Case Number: 81017115 (Cont.)

sometimes the quantity exceeds the quality." Also, he thought that titles of the individual Tech Briefs were sometimes established to fit into an organizational cataloging code rather than established on the basis of subject content.

TM:ag
7/8/69

Case Number: 80917075

Computer Applications Incorporated, Silver Springs, Maryland attempted to apply an optical-data processing technique developed at the Goddard Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Computer Applications Incorporated 8555 16th Street Silver Springs, Maryland 20910 301-587-1333	Goddard Space Flight Center
Contact: Alexander Sledge Technical Writer	Tech Brief: 68-10069

Computer Applications Incorporated is a firm dealing nationally with software aspects of the information sciences, space sciences, programming sciences, and some operations research and analysis. The Washington, D. C. branch of this firm is specifically oriented toward information processing. This Technical Support Package was ordered in conjunction with a product development project. According to Alexander Sledge, a technical writer with the firm, the chief difficulty encountered in working on the new product concerned the development of an adequate optical scanning pick off device. Over 100 hours were spent by members of the firm in attempting to develop this product, but the technical problems became too complex and the project was ultimately scrapped. No further use of this Technical Support Package is contemplated.

Mr. Sledge happened upon a reference to the NASA Tech Brief in question while reading a professional journal, Datamation. He thought that the information contained in the Technical Support Package contributed greatly to the overall project, and estimates that 20 to 25 hours were expended by members of the firm in reviewing and implementing the information supplied. Computer Applications Incorporated is not a regular recipient of NASA publications.

Mr. Sledge commented that the quality of the NASA publications he received was generally good, and the service fairly quick. He did note that, at times, printing in the complex line art is not of good resolution; he also felt that all reports should conform with the standard dimensions used in commercial industry, 8-1/2 by 11 inch pages. Though

Case Number: 80917075 (Cont.)

Mr. Sledge's prime purpose in ordering the Technical Support Package was a commercial product application, he found that the theory contained in the package was "illuminating and helpful in overall design considerations."

TM:ag
6/27/69

Case Number: 80917090

The Goodyear Aerospace Corporation has reviewed a document prepared at the Goddard Space Flight Center dealing with the principles of optical-data processing techniques.

<u>Subject</u>	<u>Technology Source</u>
Goodyear Aerospace Corporation Department 470, Plant G-3 Akron, Ohio 44315 216-794-2121 Contact: Richard F. Koch Manager, Electronic Information Systems Engineering	Goddard Space Flight Center Tech Brief: 68-10069

Mr. Richard F. Koch, the manager of Electronic and Information Systems Engineering at the Goodyear Aerospace Corporation, is a regular recipient of NASA publications and obtained the Technical Support Package from the Goddard Space Flight Center containing "Principles of Optical-Data Processing for Engineers." He was interested in increasing his state-of-the-art knowledge on the subject and spent 10 to 15 hours in reviewing the information.

He thought that the information contained in the document was concise and generally of good quality. Mr. Koch did express an opinion that the document's clarity was only fair; specifically, "the treatment of correlation in the text was overly complex and sophisticated." He felt that state-of-the-art documents possibly should be reviewed by knowledgeable, disinterested parties to insure that material presented will be understandable for the intended reader.

The Goodyear Aerospace Corporation is a regular recipient of NASA publications, and the publications are disseminated internally through a library system to department managers.

TM:ag
6/19/69

Case Number: 80916670

Lundy Electronics and Systems, Inc., has incorporated an idea developed at Goddard Space Flight Center on processing techniques for optical data within a research proposal to a governmental agency.

<u>Subject</u>	<u>Technology Source</u>
Lundy Electronics and Systems, Inc. Dumond Place Glen Head, New York 11545 516-671-1714 Contact: Herbert M. Kaufman Corporate Research Engineer	Goddard Space Flight Center Tech Brief: 68-10069

Lundy Electronics and Systems, Inc., is a medium sized electronics firm manufacturing passive countermeasure systems for the military agencies. The firm also manufactures business machines and is involved in waste management systems. The corporate research and development group, a relatively new department at Lundy, employs eight to ten research people,

The research group is currently resubmitting a proposal to a "security-type civilian government agency." As this proposal is classified, Mr. Kaufman, Research Engineer, could give no additional information. He learned of the Goddard developed innovation through a copy of Defense Industries Bulletin. About eight hours were spent by his group in reviewing the Technical Support Package, and according to Mr. Kaufman the information "put another paragraph into their proposal." Mr. Kaufman was unable to quantify any benefits or savings gained from this particular NASA information, and felt that it primarily benefited his state-of-the-art knowledge.

Mr. Kaufman does not regularly receive NASA publications, although the firm is a recipient. The publications are stored in a small company library, and Kaufman knew of no formalized dissemination procedure. He has instructed the librarian to send him any information received on topics of interest to his research group. He considers the NASA publications generally well done, and the Technical Support Package service quite good. The company is not an RDC subscriber and Mr. Kaufman was not familiar with the Regional Dissemination Centers.

TM:ag
6/25/69

Case Number: 80813300

A small New Jersey electronics firm evaluated a new circuit for a DC voltage multiplier designed at Marshall Space Flight Center, but did not develop it as a product because it was inappropriate for their market.

<u>Subject</u>	<u>Technology Source</u>
A small New Jersey Electronics Firm	Marshall Space Flight Center
Contact: Senior Engineer	Tech Brief: 68-10074

A senior engineer with a small East-coast electronics firm studied a new circuit design for a DC voltage multiplier, and experimented with a prototype for a total of 20 hours. His work did not yield the desired results because he could not isolate input and output circuits from ground. Also, the circuit appeared to be dangerous in applications involving power circuits. Since the firm sells almost entirely to the electric-power and telephone industries, the project was abandoned. If the firm had been manufacturing instruments for laboratory work, then it would have been advantageous to complete product development.

The firm maintains a small library which routes Tech Briefs it receives through its subscription to all personnel engaged in R & D work for the company. The Technical Support Package dealing with the voltage multiplier circuitry was initially received with great interest, as it appeared to be well-suited for meeting a company need for such a design. Other information sources were also tapped, and it was not possible to state the relative importance of the Technical Support Package.

Tech Briefs are highly appreciated by the senior engineer interviewed for this report. He stated that they contain ". . . very good information." The abstract format is useful, especially since more details are readily available if needed.

WH:ng
6/20/69

Case Number: 80815420

Vector Electronics Company is planning to use a technique developed by the Ames Research Center to eliminate inductors in electronic circuits. However, the company has not yet had the available manpower to incorporate the technique into its product line.

<u>Subject</u>	<u>Technology Source</u>
Vector Electronics Company 12460 Gladstone Avenue Sylmar, California 91342 213-365-9661 Contact: Ray R. Scoville President	Ames Research Center Tech Brief: 68-10084

Vector Electronics is a relatively small company (100 employees including four engineers) that produces electronic components including terminals, punch boards, printed circuits, and cabinets. Over 80 percent of the sales are to commercial markets, mainly electronic manufacturers.

Mr. Scoville indicates that while the NASA-developed technique for eliminating inductors in circuits appears to show great promise, his company has not had time as yet to do anything with it because of the current heavy work load on the limited number of engineers on his staff. He emphasizes, however, that the company has not abandoned the technique and hopefully will be able to pursue it in the near future.

Scoville regularly receives, and reviews, Tech Briefs and frequently passes them on to others on his staff. He said that in addition to electronics, he is very interested in following developments in the biomedical field. (It was suggested that he personally contact George Edwards, Technology Utilization Officer, Ames Research Center to facilitate the flow of biomedical information to his company. Scoville indicated that he will call Edwards.)

Scoville said that his company receives no NASA material other than Tech Briefs. He is not familiar with the services available through a Regional Dissemination Center.

Case Number: 80815420 (Cont.)

The inability to obtain an exclusive patent for the technique described in Tech Brief: 68-10084 was not viewed by Scoville as being important. It is his feeling that if his company makes such a product, their development of the art would protect them from competition.

DCC:ag
6/27/69

Case Number: 81017920

The Barrett Chemical Products Division, Allied Research Products Incorporated, Detroit, Michigan investigated an electroforming process developed at the Lewis Research Center.

<u>Subject</u>	<u>Technology Source</u>
Allied Research Products, Incorporated Barrett Chemical Products Division 400 Midland Avenue Detroit, Michigan 313-TU3-0100 Contact: Gerald A. Laitenen Product Development Chemist	Lewis Research Center Tech Brief: 68-10107

The Barrett Chemical Products Division of Allied Research Products Incorporated is an industrial supplier of electroforming solutions, specializing in sulfamate nickel plating. Mr. Gerald Laitenen, a product development chemist with the firm, stated that he had learned of the electroforming process developed at Lewis Research Center at a conference he had attended several years ago. Mr. Laitenen requested the Technical Support Package after reading of the Tech Brief in the February, 1968 issue of Plating magazine.

Although he found that the supplied NASA information was not applicable to the work being done at Barrett, Mr. Laitenen thought that the information might be of some use as a reference for a specification of the American Society for Testing Materials (ASTM). Mr. Laitenen was not able to elaborate further on specific use of the NASA information in an ASTM specification, but he felt that the information would be applicable only as a secondary reference for a much more general electro-forming specification.

Mr. Laitenen is not a regular recipient of NASA publications, and he did not know if his company is an RDC subscriber. Mr. Laitenen noted that at the convention which he attended when the original information contained in the Technical Support Package was presented, a Mr. Frank Carlin raised certain pertinent questions during the formal discussion period following the presentation of the paper. Mr. Laitenen

Case Number: 81017920 (Cont.)

feels that the questions raised by Mr. Carlin have never been fully answered, and he feels these questions should have been answered before the final Technical Support Package was issued.

TM:ag
6/24/69

Case Number: 81119730

The Timken Roller Bearing Company has investigated the possibility of developing a commercial product based on a Lewis Research Center developed dry self-lubricating bearing concept.

<u>Subject</u>	<u>Technology Source</u>
Timken Roller Bearing Company Canton, Ohio 44703 216-453-4511	Lewis Research Center
Contact: Erik Dominik Research Engineer	Tech Brief: 68-10165

The Timken Roller Bearing Company is a manufacturer of tapered roller bearings, alloy steel bars, and seamless tubing. Mr. Erik Dominik, a research engineer with the firm, is a regular recipient of NASA publications and learned of the Lewis developed innovation through a Tech Brief. Mr. Dominik felt that the Technical Support Package increased his state-of-the-art knowledge and had the potential of leading to a new commercial product.

About 40 hours were spent by Mr. Dominik and his staff in evaluating the NASA information. Mr. Dominik considered initiating a project proposal which would have as its ultimate goal the development of a self-lubricating bearing similar to that described in the Tech Brief. The main impediment to such a development project is potential demand; the market research department of the firm has been unable to identify potential markets for unlubricated bearings of this nature.

The Timken Roller Bearing Company regularly receives NASA publications, and routes them to the entire professional staff through the research library. At times the research library will summarize and distribute certain NASA information which they feel may be applicable to certain staff members. Mr. Dominik is "well satisfied" with the NASA dissemination program. Overall he thinks that the Technical Support Package service time is satisfactory, but at times he states that it "could be a little faster." He thinks that Timken is an RDC subscriber, but he is not sure.

TM:ag
7/8/69

Case Number: 80816350

The Michigan Chemical Corporation, St. Louis, Michigan is utilizing concepts concerning fire-retardant properties of Saran film developed at the Manned Spacecraft Center.

<u>Subject</u>	<u>Technology Source</u>
Michigan Chemical Corporation 500 North Bankson St. Louis, Michigan 48880 517-681-2141 Contact: Darwin Dalzell Group Leader, Applications	Manned Spacecraft Center Tech Brief: 68-10177

The Michigan Chemical Corporation is a medium-sized chemical firm dealing in flame-retardant products. Mr. Darwin Dalzell, a chemist with the firm, had been working on the development of a new product when he came across a reference to the NASA Tech Brief in question in an issue of Modern Plastic (a professional journal). According to Mr. Dalzell, the NASA information pointed out a basic mistake in his then-current project.

Work on the project concerned was terminated in April of 1969, but Mr. Dalzell expects that the work will soon resume, and he anticipates a patentable product will emerge. (Further information concerning the product was considered proprietary by this gentleman.) He estimated the importance of the NASA information as contributing about 25 percent of the overall development necessary to define the new product, but was unable to estimate dollar savings or benefits resulting from the information. The new product is being developed in the company's Applications Department, with four professional staff members and three technicians contributing to this effort.

The Michigan Chemical Corporation is not a regular subscriber to NASA publications, and the company is not an RDC subscriber. Mr. Dalzell considered the NASA publications generally of good quality but, at times, somewhat incomplete.

TM:ag
6/27/69

Case Number: 81118530

The Formica Corporation, Cincinnati, Ohio has investigated the potential use of the fire-retardant properties of Saran film investigated and reported by the Manned Spacecraft Center.

<u>Subject</u>	<u>Technology Source</u>
Formica Corporation 4614 Spring Grove Avenue Cincinnati, Ohio 45232 513-563-1400	Manned Spacecraft Center
Contact: Dr. S. A. Gidding Department Head (Mrs.) Pauline Deitzel Librarian	Tech Brief: 68-10177

The research and development division of the Formica Corporation has undertaken research in the field of high pressure laminates. Dr. S. A. Gidding learned of the fire-retardant properties of Saran film through a professional journal and ordered the Technical Support Package through the division's library. Roughly two hours were spent in review and evaluation of the information in the Technical Support Package, but no use of the information is contemplated. Dr. Gidding did state that the information "could be part of a new product," but that such development was not in line with work presently being undertaken by the division.

The Formica Corporation is a subsidiary of the American Cyanamid Company. The research division of the American Cyanamid Company in Stamford, Connecticut disseminates relevant NASA publications to the Formica Corporation. The Formica Corporation is not a regular RDC subscriber, and Dr. Gidding could offer no comment about the NASA publications.

During the follow-up contact with the Formica Corporation, an interview was conducted with a librarian, Mrs. Pauline Deitzel. Mrs. Deitzel stated that the research and development division of the Formica Corporation has a 600 volume library. She is solely responsible for the library, dividing her time equally between librarian tasks and secretarial tasks. The division is in the process of expanding this library and plans to train Mrs. Deitzel so she may take it over on a full-time basis. Training will consist of a night course in general librarianship

Case Number: 81118530 (Cont.)

taken at the University of Cincinnati at the company's expense. The division had subscribed to NASA publications for a year, but then dropped the subscription due to lack of facilities; Mrs. Deitzel expects that the subscription will be renewed once adequate storage facilities have been obtained. All ordering of NASA publications for the Formica Corporation is done through Mrs. Deitzel, but she knows of no formal dissemination program for this information.

TM:ag
6/26/69

Case Number: 81220220

The Sandia Corporation, Albuquerque, New Mexico is fabricating a prototype of a metallic detection device developed at Marshall Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Sandia Corporation	Marshall Space Flight Center
Sandia Laboratories	
P. O. Box 5800	Tech Brief: 68-10183
Albuquerque, New Mexico 87115	
505-264-5961	
Contact: Robert D. Eiler	
Staff Assistant	

The Sandia Corporation, a prime AEC contractor, is involved in the environmental testing of large electronic assemblies. According to Mr. Robert D. Eiler, staff assistant in the Electronic Component (passive) Qualification Division, the innovation developed at Marshall Space Flight Center "appeared to be exactly what was desired and would save approximately 100 manhours of design, drafting, and fabrication."

Sandia is attempting to use the detection device to locate semiconductor devices in potting compound mediums within the large assemblies. Mr. Eiler stated that the project was assigned low priority and probably no more than half a dozen detection devices would be fabricated once the prototype was working satisfactorily. In addition, he mentioned that properly working devices would save the company additional costs since presently it is necessary to rip out large amounts of potting compound in order to locate the semiconductors.

Mr. Eiler went on to say, however, that "detailed information received was incomplete, confusing, and has delayed completion." He specifically noted a range switch diagram which was shown in the text but not in the schematic. He was led to believe that the device would be able to locate a dime at ten inches, but thus far the prototype has only been able to locate a nail at two inches. Mr. Eiler rated the completeness and clarity of the Technical Support Package as "poor." He has written to Marshall Space Flight Center for clarifying details, and hopes to complete the project when this information is received.

Case Number: 81220220 (Cont.)

Mr. Eiler is a regular recipient of NASA publications, publications being routed to him through a central technical library at Sandia. The library issues a monthly listing of publications received. The company is an RDC subscriber, but Mr. Eiler did not feel in a position to comment on the RDC effort.

The Technical Support Package under question is Mr. Eiler's first contact with this medium of NASA publications; therefore he thought it would be better to reserve judgement on the quality of the Technical Support Package effort. He did state that if present performance were an indication of the overall TU service, he would be hesitant in the future about ordering additional Technical Support Packages.

TM:ag
7/3/69

Case Number: 90526122

A research team at Denver General Hospital and The University of Colorado Medical School has developed a new use for a plethysmograph developed under contract to NASA's Manned Spacecraft Center.

<u>Subject</u>	<u>Technology Source</u>
Marvin Pomerantz, M.D.	Manned Spacecraft Center
Chief of Surgery	
Denver General Hospital	Tech Brief: 68-10220
Denver, Colorado	
303-244-6969 Ext. 215	

A research team composed of surgeons and laboratory technicians at Denver General Hospital and the University of Colorado Medical School has been testing an impedance plethysmograph developed under NASA contract. After successful laboratory use, the instrument is now being used in clinical applications.

During the summer of 1968, Dr. Marvin Pomerantz and several colleagues began to experiment with plethysmographic measurement of changes in thoracic impedance brought on by pulmonary edema, or accumulation of fluid in the lungs. They reasoned that an increase of fluid in the chest would alter the impedance or resistance to electrical current flowing through the chest. With the assistance of a medical student who also has a degree in electrical engineering and a laboratory technician who is an engineer, they devised a plethysmographic system to measure variations in impedance caused by pulmonary edema. Their system was somewhat cumbersome, and they experienced some problems in designing appropriate electrodes.

A review of the literature on plethysmography turned up the work of Dr. W. B. Kubicek of the University of Minnesota, who has developed an instrument for the Manned Spacecraft Center (MSC) to measure cardiac ventricular output. John Wheeler, Technology Utilization Officer at MSC, and Dr. Kubicek were contacted and one of Kubicek's instruments was loaned to the Denver group.

Kubicek's device immediately replaced the system that had been in use in the Denver laboratory. The new instrument had several advantages, including greater stability and a considerably better electrode system. Dr. Pomerantz considers the instrument to be a "paramount" factor in

Case Number: 90526122 (Cont.)

the total research effort, and estimates that it will be considerably less expensive than the system with which he began the research project.

If clinical use is as successful as the laboratory experiments have been, there should be a great market potential for the instrument. Every patient-monitoring system in the country would be a potential user. Other applications that have occurred to Dr. Pomerantz include studies of blood flow in bodily extremities. Some work is already being done in this area. The primary clinical use, however, would be as a warning indicator of the onset of edema, allowing immediate remedial treatment.

No significant technical problems have been encountered in Dr. Pomerantz's experiments with the instrument. No design changes were necessary, even though the application is different from that for which the instrument was designed. Dr. Kubicek's interest had centered on measuring ventricular stroke volume or cardiac output. He accomplished these measurements by placing two conductive strip electrodes around the neck, one around the chest, and one around the abdomen. The top-most and bottom bands are situated at least three centimeters from the inner bands, and are connected to a constant sinusoidal current source. The inner two bands are connected to detection circuits which monitor the basic impedance between the two inner bands, as well as the impedance change induced by cardiac output.

Dr. Pomerantz's primary interest is with changes in the basic impedance of the body, rather than the fluctuations caused by cardiac output, although he also generally takes readings of the latter. In his laboratory and clinical uses of the system he has found a nearly perfect linear relationship between the severity of edema and basic impedance measurements. The most difficult factor in his use of the system is to establish a base measurement--a "normal" basic impedance--with which to make comparisons as edema causes change in the reading taken between the two inner electrodes. Each shape and size of human body has a different basic impedance and waveform, so it is necessary to obtain measurements as soon as possible after trauma in order to establish a "normal" pre-edema pattern. There is usually sufficient time and opportunity to achieve this.

Case Number: 90526122 (Cont.)

Dr. Pomerantz is Chief of Thoracic and Cardiac Surgery at Denver General Hospital, but he allocates one-third of his time to research. This arrangement has made it possible for him to test the system thoroughly both in the laboratory and in clinical application. As a result of the work done on this project, he will present a paper at a June 1969 symposium on impedance cardiography in Houston. He has also prepared a scholarly paper on the subject, which will be published in the July 1969 Journal of Surgery.

Dr. Pomerantz had never seen Tech Brief 68-10220 or any other NASA Tech Briefs, although he had in his files a copy of Dr. Kubicek's paper describing the plethysmograph. He expressed interest in NASA's biomedical instrumentation, and copies of relevant Tech Briefs were sent him from Denver Research Institute files, along with copies of the Cumulative Index to NASA Tech Briefs.

WH:ng
5/14/69

Case Number: 81017195

The Tube Turns Division of The Chemetron Corporation, Louisville, Kentucky has made use of a report published at the Marshall Space Flight Center concerning the effect of surface irregularities on bellows fatigue life.

<u>Subject</u>	<u>Technology Source</u>
Chemetron Corporation Tube Turns Division Louisville, Kentucky .40201 502-774-6011 Contact: W. F. Melhorn Director of Metallurgy	Marshall Space Flight Center Tech Brief: 68-10229

The Tube Turns Division of the Chemetron Corporation employs over 1,500 people in the manufacture of bellows expansion joints. According to Mr. Melhorn, the Director of Metallurgy of the firm, the company had originally started out to sell bellows expansion joints to industry. But, as the business developed, it soon became evident that it was impossible to carry a sufficient number of different types in stock to satisfy every request for bellows. Since that time, the company has stocked only component parts for their bellows system and now builds special assemblies from the component parts to satisfy individual customers.

Mr. Melhorn stated that the two most common types of failures in their stainless steel bellows are straight fatigue failures and stress-corrosion failures. A major problem to the firm is the differentiation between these two types of failures. He said that for many years there was no information available concerning fatigue failure in thin stainless steel materials. He thinks that the information supplied by Marshall Space Flight Center has helped his designers in determining the causes of failures and, although he was unable to quantify the direct benefits received from this particular Tech Brief, he did state that the information had been useful in quality improvement efforts.

Mr. Melhorn is a regular recipient of NASA publications. He reviews all the Tech Briefs which he receives and orders the Technical Support Packages he feels are relevant to his work; these are stored in a special metallurgy library (the firm maintains a research library

Case Number: 81017195 (Cont.)

which also receives NASA publications). Being production oriented, Mr. Melhorn finds it difficult to find the time to maintain his own metallurgy library. He considered the overall quality of NASA publications very good. The company is not an RDC subscriber.

TM:ag
6/25/69

Case Number: 81220226

The West Coast Division of the Marotta Valve Corporation has reviewed tests on bellows fatigue life undertaken at the Marshall Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Marotta Valve Corporation P. O. Box 179	Marshall Space Flight Center
2215 Standard Avenue Santa Ana, California 92702 714-540-5810	Tech Brief: 68-10229
Contact: Robert Ferrari Engineering Manager	

The West Coast Division of the Marotta Valve Corporation employs over 60 people in manufacturing precision controls. Before the project was suspended, this company was developing a pressure relief valve utilizing a bellows for the MOL program. At that time, they had employed a Mr. Roger Van de Walker, a design engineer, who requested the Technical Support Package from Marshall Space Flight Center dealing with "Effects of Surface Irregularities on Bellows Fatigue Life."

When work on the MOL project was suspended, Mr. Van de Walker left the firm and we have been unable to contact him. According to the questionnaire we received from him, roughly two to three hours were expended in reviewing the Technical Support Package. He stated that the Technical Support Package provided information of great value to his work. According to Mr. Ferrari, Engineering Manager of Marotta Valve Corporation and Mr. Van de Walker's former supervisor, the NASA information did prove of some value to the work being undertaken on the MOL project, but since work on the MOL project has been suspended, no further use is contemplated for this NASA information.

Mr. Ferrari is a regular recipient of NASA publications; he receives these publications directly and routes them to all his engineering staff. The NASA publications are stored chronologically in a loose-leaf binder, as they are received. Mr. Ferrari stated that he finds the publications

Case Number: 81220226 (Cont.)

very useful and refers to them in many instances. He has ordered publications through the Clearinghouse and considers the charge for the documents well worth the price. The company is not an RDC subscriber.

TM:ag
6/26/69

Case Number: 80916025

A telemetry system, similar to an electrocardiograph telemetry system developed at Flight Research Center, is being tested for non-medical use by a manufacturer.

<u>Subject</u>	<u>Technology Source</u>
A manufacturing firm	Flight Research Center
	Tech Brief: 68-10233

An experimental program is being conducted by a manufacturing firm in order to perfect a telemetry system for an industrial client. Competitive circumstances preclude release of details, but the general nature of the system can be described as involving location and monitoring of moving vehicles and transmission of data from the vehicles. The data is transmitted in digital form and fed into a dataphone link. For some uses the data is converted to analog form, and then back to digital form for dataphone transmission.

The firm had been working on such a system for some time when the subject Technical Support Package was issued. The company R & D supervisor spent about ten hours studying the Technical Support Package and then proceeded with his own very similar ideas. The most significant value of the Technical Support Package was psychological: its review convinced the R & D supervisor of the workability of his concepts. In terms of relative input, the Technical Support Package accounted for not more than ten to twenty percent of the total information input.

The firm's library receives Tech Briefs by subscription and automatically circulates them among the R & D staff.

The R & D supervisor had one complaint about the Tech Brief system which relates to the relative uselessness of many of the documents for his firm; he might review 100 documents in a one to two month period, but find only one Technical Support Package in six months that is useful.

WH:ng
5/23/69

Case Number: 80916030

The firm of Orenstein and Bernstein, certified public accountants, New York City investigated (for a client) the potentials of a system developed by Flight Research Center for transmitting electrocardiographs by RF and telephone links in an emergency situation.

<u>Subject</u>	<u>Technology Source</u>
Orenstein and Bernstein Certified Public Accountants 1440 Broadway New York, New York 10018 212-279-8633 Contact: Samuel J. Orenstein	Flight Research Center Tech Brief: 68-10233

Orenstein and Bernstein, a certified public accounting firm, serves a clientele in New York and several surrounding states. According to Mr. Samuel Orenstein, a principal in the firm, they are constantly looking for new innovations which may be of interest to their customers.

Mr. Orenstein learned of the electrocardiograph transmission system developed at Flight Research Center through a Tech Brief. He spent an hour of his time reviewing the Technical Support Package, then presented the concept to a client at lunch. The client involved operates an ambulance service, and Mr. Orenstein thought that the transmission system might be of some value to him. The client considered the innovation but concluded that his present method was satisfactory.

Although he works as a certified public accountant, Mr. Orenstein is quite interested in developments in scientific and technical fields. His educational background includes studies in the natural sciences, and he currently holds membership in the Institute of Management Science and the Nuclear Society.

Mr. Orenstein is a regular recipient of NASA publications and finds them to be an excellent source for innovative ideas which he can recommend to his clients for potential use. He has ordered publications through the Clearinghouse, also, and finds the service satisfactory and the price equitable.

TM:ag
6/19/69

Case Number: 812221396

Leigh Systems, Inc., Syracuse, New York has incorporated into their test equipment a percent recharge unit as defined in information received from the Goddard Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Leigh Systems, Inc. 220 Boss Road Syracuse, New York 13211 315-437-2975 Contact: John D. Cameron Chief Inspector	Goddard Space Flight Center Tech Brief: 68-10273

Leigh Systems, Incorporated fabricates, markets and services a Crash Locator Beacon primarily used by the Air Force. For some time, the Quality Control Department at Leigh Systems had been experiencing a high rate of failure on 2 amp hour sealed cylindrical nickel-cadmium cells used in their Crash Locator Beacons during repeated charge-discharge applications. Due to this high rate of failure, they had been investigating more effective ways of testing to condition battery cells in the beacons.

Upon receiving the Tech Brief and subsequently the Technical Support Package, they constructed a percent recharge unit and have incorporated this unit into their test equipment. The unit is not used for optimum recharging of battery cells as recommended by NASA, but rather it is used in conjunction with their test equipment for conditioning the battery cells. With the incorporation of this percent recharge unit they have reduced failure rates of the 2 amp hour battery cells at all stages of production. They have also increased the reliability of the crash locator beacon units and have reduced warranty claims. Mr. Cameron estimated that the cost of fabricating and incorporating the percent recharge unit into their equipment amounted to approximately 500 hours labor and \$1,600 for hardware. For this investment, they expect to reduce their costs by approximately \$28,000 annually.

At Leigh Systems, Incorporated, Tech Briefs are regularly received through the library. The Tech Briefs are then disseminated to various departments on routing slip. A file is also maintained for future reference. Mr. Cameron stated that "the clarity and level of information

Case Number: 81221396 (Cont.)

in the NASA publications reviewed was excellent." However, when comparing the service received in obtaining the Technical Support Package from NASA to the service received in obtaining information requested from other governmental agencies, Mr. Cameron thinks "NASA is a little slow."

RB:ng
7/23/69

Case Number: 90121476

The Western Division of Sylvania Electric Products, Incorporated, Mountain View, California has reviewed a document from the Marshall Space Flight Center on microminiature electronic component technology.

<u>Subject</u>	<u>Technology Source</u>
Sylvania Electric Products, Inc.	Marshall Space Flight Center
Western Division	
P.O. Box 205	Tech Brief: 68-10310
Mountain View, California 04040	
415-966-2893	
Contact: M. Hurowitz	
Manager, Advanced	
Physical Design Process	

The Western Division of Sylvania Electric Products, Incorporated is primarily interested in electronics systems with a major interest in microminiature electronics and in advanced packaging techniques. According to Mr. Hurowitz the laboratory at the Western Division is presently in the process of doing research on microminiature electronic component joining techniques and is developing the required processes. Although Mr. Hurowitz's memory of this particular Technical Support Package was somewhat vague, he recalled that the information was used to substantiate processes in the printed circuit board materials selection area and in microsoldering methods.

Mr. Hurowitz stated that a literature search was made to discover and obtain all of the information available on microminiature electronic component joining technology. As a result of this search, the NASA Technical Support Package and other literature from joining companies and equipment manufacturers was obtained. He felt that the NASA information was "worth-while" particularly since it was "an authoritative source and a well written article." The immediate use of the Technical Support Package involved approximately ten hours in reviewing the information. However, the information has also been disseminated for future reference to Sylvania engineers in advanced development in chemical and electronic areas and to project engineers.

NASA publications are received by the library at the Western Division. The publications are maintained on file and a publication bulletin is

Case Number: 90121476 (Cont.)

sent to various departments which define's the general information available in the library. They also have available sets of the NASA "Cumulative Index to NASA Tech Briefs" which are frequently referred to when looking for information, according to Mr. Hurowitz.

R.B:ag
7/24/69

Case Number: 90122064

The Dow Chemical Company, Midland, Michigan has reviewed and is using a manual on hydrogen safety from the Lewis Research Center.

<u>Subject</u>	<u>Technology Source</u>
Dow Chemical Company Midland Division Midland, Michigan 48640 517-636-0854	Lewis Research Center
Contact: W. C. Brasie Process Specialist; Process Systems Engineering	Tech Brief: 68-10323

The Midland Division of the Dow Chemical Company processes large amounts of hydrogen as a part of its chlorine operations. Safety is a direct concern and a part of any equipment design to be utilized in their facilities. As a part of this safety effort under their safety and loss prevention function, three full time specialists in fire protection engineering are concerned with all equipment designs. They also have a corporate level safety and loss prevention group who are concerned with safety considerations in any new plant or facility design.

According to Mr. Brasie, a program was initiated to study "gas cloud explosions." This is a safety consideration at the Midland division since they have many highly volatile processes and some of the older buildings are close to one another creating potential safety hazards. The manual on hydrogen safety received from NASA was used in this study since it contains data not readily available from other sources. It was also made available to other groups within the company concerned with the safety aspect of equipment and facility design. Use of the manual involved approximately 20 hours of study and intangible benefits were derived from its use.

Mr. Brasie is a regular recipient of NASA Tech Briefs and he feels "they are generally well developed brief descriptions of an innovation." He rated the manual received on hydrogen safety as "excellent." However, he does think that a lot of the material referenced pertains to

Case Number: 90122064 (Cont.)

other government documents which are not readily available. Therefore, the reader must either accept the information at face value or go to a fair amount of effort to obtain the materials referenced.

RB:ag.
7/15/69

Case Number: 81220546

The Applied Mathematics Department of Battelle Northwest, doing work for the Atomic Energy Commission (AEC), has reviewed a document from the Marshall Space Flight Center concerning the microprobe investigation of segregated particles in aluminum MIG and TIG welds.

<u>Subject</u>	<u>Technology Source</u>
Battelle Northwest	Marshall Space Flight Center
Battelle Memorial Institute	
P. O. Box 999	Tech Brief: 68-10334
Richland, Washington 99352 .	
509-946-2317	
Contact: James A. Merrill	
Senior Research	
Scientist	

Battelle Northwest, at the Battelle Memorial Institute Pacific Northwest Laboratory (an AEC prime contractor), is "quite interested in various approaches used in data correction." Mr. James A. Merrill, senior research scientist in the Applied Mathematics Department, was not able to discuss the specific use of the information since it is applicable to a classified project for AEC. However, they are concerned with achieving exactitude, and particularly fluorescence correction and absorption correction. Mr. Merrill commented: "This information received is quite a little removed from our particular problem, but we are interested in the approach used and background information. Some useful experimental results, conclusions, and observations concerning techniques were presented." Approximately ten to twelve hours were spent in reviewing the information.

Mr. Merrill stated that he frequently scans Tech Briefs and has been "quite satisfied with the content and quality." Tech Briefs are received at the library at Battelle Northwest, and then disseminated to applicable areas and personnel via routing slip. Mr. Merrill was not sure if his company is an RDC subscriber, but he believes it is.

RB:ag
7/7/69

Case Number: 90121402

The Hand Tool Division of Sargent & Company has reviewed a publication from the Marshall Space Flight Center entitled "Electromotive Series Established for Metal Used in Aerospace Technology."

<u>Subject</u>	<u>Technology Source</u>
Sargent & Company Hand Tool Division New Haven, Connecticut 06509 203-562-2151	Marshall Space Flight Center Tech Brief: 68-10385
Contact: George J. Filia Design Engineer	

The Hand Tool Division of Sargent & Company serves the electronics industry in manufacturing and designing hand, air, or hydraulic tools for any desired application. According to Mr. Filia, a design engineer with the firm, the division must keep abreast of developments in space technology to better meet the needs of its customers. Much of the firm's work is in conjunction with government contracts, and thus regulated by government specifications. Mr. Filia considers NASA publications the best medium to keep abreast of current developments.

Mr. Filia is a regular recipient of NASA publications, receiving them directly and disseminating the information to others in the factory. He also disseminates information to friends outside the firm including personnel at AVCO and other electronic companies. According to Mr. Filia, "some of the NASA publications are stored at his house, others at the factory, and others are given to friends." He did not know if his firm was an RDC subscriber.

Although Mr. Filia rated the Technical Support Package as providing information of great value to his work, no specific benefits were directly attributed to the information, and no existing processes were altered. Mr. Filia sees the greatest advantage of the NASA publications as being related to real time savings. The information is practical documentation as to what has been done and how it has been done. He feels the information is "about as up to date as he could find anywhere, including recent text books." Mr. Filia finds test results of processes and materials especially valuable, since his company no longer has to perform the experiment at work. Mr. Filia felt that the NASA

Case Number: 90121402 (Gont.)

publications would be a real asset to foreign countries, and such foreign dissemination might help defray the large investment in the space program.

TM:ag
7/9/69

Case Number: 90121408

S. F. Durst & Company, Philadelphia, Pennsylvania has received and used information on the probable future of oceanographic research as furnished by the Marshall Space Flight Center. This information was used in planning their corporate policy.

<u>Subject</u>	<u>Technology Source</u>
S. F. Durst & Company, Inc. 5317-21 North 3rd Street Philadelphia, Pennsylvania 19120 215-329-9700 Contact: J. C. Busby Vice President	Marshall Space Flight Center Tech Brief: 68-10397

The S. F. Durst & Company, a manufacturer of ethical pharmaceuticals and medical instrumentation believes that continued growth is dependent upon their ability to remain knowledgeable and abreast of technological change. This is particularly true of the bio-medical field and oceanographic research. As chief planning officer for S. F. Durst & Company, Mr. Busby feels that the charts received from NASA reinforced his belief that oceanography is a field that offers good growth possibilities for his company.

According to Mr. Busby, the company is contemplating development of medical items for the oceanography field. In conjunction with this, the charts supplied by NASA were used in developing two year and long range plans as to where manpower and dollar resources should be aimed. The charts were useful in this planning effort, but they were not significant in comparison to the total information required.

As a consultant in the bio-medical field with NASA, Mr. Busby receives NASA publications directly which he reviews and disseminates to others as applicable to their interests. Mr. Busby stated that "on the whole I feel that technology transfer is certainly effective." However, Mr. Busby thinks that the "boiler plate" put at the end of the Tech Briefs relating to patent action could be improved. The Tech Brief should state "who by name and phone number knows about a particular

Case Number: 90121408 (Cont.)

brief so that he can be contacted directly." This, he thinks would help further facilitate technology transfer and the utilization of the technology developed.

RB:ag
7/15/69

Case Number: 90728905

The True Temper Corporation was contacted regarding an advertised claim that True Temper golf club shafts are manufactured from new materials developed for aerospace and aviation uses.

Subject

True Temper Corporation
185 Water Street
Geneva, Ohio 44041
216-466-1156
Contact: Mr. George Manning
Manager, Technical Sales and Service

An advertisement carried in the April 1969 issue of Golf Digest magazine stated that "the True Temper aluminum shafts used by leading club makers are fabricated of an aluminum alloy recently developed for aviation and aerospace projects."

Mr. Manning of True Temper identified the shaft material which has been in use since June 1967 as alloy 7178. Prior to Reynolds Aluminum's supplying this alloy, True Temper had expended extensive time and funds in attempting to develop a satisfactory shaft configuration.

Mr. F. F. Dietsch, the Director of Technical Information of the Research and Development Department at Reynolds Aluminum in Richmond, Virginia, was contacted to verify that this aluminum alloy had been developed in aviation and aerospace research. Mr. Dietsch stated that alloy 7178 is "a real old alloy." Its previous numerical designation was 78s. Mr. Dietsch further indicated that this alloy was developed by the Alcoa Corporation approximately fifteen years ago.

Based on this information, it does not appear that the development of these aluminum shafted clubs resulted from a transfer of NASA technology.

RJ:le
4/5/69

Case Number: 81118723-81118724

Magnetronics, Incorporated evaluated two clamping methods developed at the Marshall Space Flight Center. One of these techniques, a clamp which provides an efficient connection for large electrical currents, may be incorporated into a product being considered by the firm.

<u>Subject</u>	<u>Technology Source</u>
Magnetronics, Incorporated 5718 Clarewood Houston, Texas 77036 713-667-2411 Contact: Richard H. Wesley President	Marshall Space Flight Center Tech Briefs: 67-10105, 67-10140

Magnetronics, Incorporated is a 28 employee firm engaged in the manufacturing and development of "five or six proprietary items."

Mr. Richard H. Wesley, the president of the firm, was originally employed by General Dynamics Company where he worked with electromagnetic metal forming processes. Presently, Magnetronics is working on a project which deals with high energy rate metal forming for which it is building capacitor discharge equipment capable of handling up to 5,000 amperes. The firm hopes to incorporate the innovation developed at Marshall Space Flight Center into their equipment design.

Mr. Wesley places the importance of the NASA innovation as "second or third from the top," or about 40 percent of the overall project. Thus far 25 to 30 hours have been expended by members of the firm in applying the information. Presently no patents are being considered by the firm, but according to Mr. Wesley, once the final development of the equipment has been completed, he may consider patent applications.

Mr. Wesley was unable to quantify savings or benefits resulting from the NASA innovation at this stage of the development.

At one time Magnetronics was working on government contracts and regularly received NASA publications. As the firm is no longer doing government contract work, NASA publications are now obtained through the Small Business Administration. Mr. Wesley considers the Technical

Case Number: 81118723-81118724 (Cont.)

Support Packages he has received extremely good and relevant to his work. Although the firm is not an RDC subscriber, they have considered the possibility of subscribing and may do so within the near future.

TM:ag
7/24/69

Case Numbers: 8119650, 8119651

Lieutenant Commander Jerry A. Phelps, U. S. Naval Hospital, Camp Lejeune, North Carolina plans to use a telemetry system developed at the Ames Research Center for monitoring the electrocardiograms of patients in the operating room. He also investigated the possibilities of using a cardiôtachometer developed at Ames.

<u>Subject</u>	<u>Technology Source</u>
Naval Hospital Camp Lejeune, North Carolina 28542 919-346-2111	Ames Research Center Tech Briefs: 67-10598 68-10065
Contact: Jerry A. Phelps Lieutenant Commander Chief of Anesthesia	

Lieutenant Commander Phelps, Chief of Anesthesia at the U. S. Naval Hospital, Camp Lejeune, North Carolina has recently developed a peripheral pulse monitor on which he is applying for a patent through the Office of Naval Research. An article about this innovation will appear in the July-August 1969 issue of Anesthesia and Analgesia: Current Researches.

According to Commander Phelps, the innovation is still dependent on a direct cable readout, and he feels that such a cable in the operating room poses potential hazards. Therefore, in six to nine months he plans to begin work on a single-channel telemetry system which will monitor the electrocardiograms of patients in the operating room. After developing the single channel telemetry system, he hopes to progress to a multiple-channel system to monitor both EKG and pulse readouts.

In developing a multiple-channel system, Commander Phelps is considering use of a multichannel implantable telemetry system developed at Ames Research Center. He first learned of the NASA Technical Support Package through the September, 1968 issue of Medical Electronics News. As the Commander pointed out, the system as he contemplates use will not actually be implanted in the patient, but will only be attached while the patient remains in the operating room.

Case Numbers: 8119650, 8119651 (Cont.)

Thus far, Commander Phelps has expended only about five hours of his personal time in reviewing the supplied information, but anticipates spending a great deal of time on the development stage. He will be leaving the military service in two to three months and all developments will be undertaken on his own time and at his own expense as a private citizen.

Commander Phelps also spent about three hours evaluating the potential application of a cardiotachometer with linear beat-to-beat frequency response, another innovation developed at Ames Research Center. An integrating circuit cardiotachometer is presently used at the Camp Lejeune hospital. Using an integrating circuit cardiotachometer, it would take 15 to 20 seconds for this instrument to register a change in pulse rate from 60 to 120 beats per minute; the linear beat-to-beat tachometer would instantly register the change. The Commander felt that there were advantages and disadvantages to either system. In the operating room the cardiotachometer is employed as an indicator of heart rate. Although the present system does not give exact measurements of instantaneous changes in the heart beat, it does provide instant indication that change is taking place. Commander Phelps felt that the beat-to-beat cardiotachometer might fluctuate to such an extent that meaningful readings might be difficult to obtain, and he concluded that the present system is adequate for the needs of the hospital.

Lieutenant Commander Phelps stated that he was very happy to give assistance in completing the follow-up reports as he felt the NASA dissemination program was an important and beneficial undertaking.

TM:ag
6/19/69

Case Numbers: 81017054, 81017055

The Ranco Controls Division of Ranco Incorporated, Delaware, Ohio investigated (1) a bellows testing fixture and (2) an automatic reel for controlling filler wire in welding machines, two innovations developed at the Manned Spacecraft Center.

<u>Subject</u>	<u>Technology Source</u>
Ranco Incorporated	Manned Spacecraft Center
Ranco Controls Division	
555 Delaware - London Road	Tech Briefs: 67-10111
Delaware, Ohio 43015	66-10236
614-363-1225	
Contact: Harold J. Bland	
Tool Engineer	

The Ranco Controls Division of Ranco Incorporated, is a large manufacturer of controls for the air conditioning, refrigeration, and automotive industries. The division has three plants; over 1,100 persons are employed in their Delaware, Ohio plant.

Mr. Harold J. Bland, a tool engineer for the firm, came across the two Tech Briefs while reading the professional journal of the Society for Tool Engineers; he requested the Technical Support Packages through the Small Business Administration. Mr. Bland is not a regular recipient of NASA publications, and he did not know if any other employees of the firm were regular recipients.

The Technical Support Package describing the automatic reel controlling filler wire in welding machines was of little use; Mr. Bland turned the information received on the fixture for testing bellows over to the methods department for evaluation. The methods department spent only a few hours in evaluating the innovation and since then nothing else has been done with the information. According to Mr. Bland, the innovation might be useful at some future date for quality control in the bellows manufacturing operation, but he could offer nothing more precise now.

TM:ag
6/25/69

Case Numbers: 80916384, 80916385, 80916394, 80916395 (Cont.)

Mr. Williams thinks that the quality of the NASA publications is quite good, and he is particularly impressed by the completeness of the Technical Support Packages. Although he is considering doing so, as yet he has not ordered publications through the Clearinghouse.

TM:ag

6/27/69

Case Numbers: 80916384, 80916385, 80916394, 80916395

The Williams Aluminum Company, a small aluminum fabrication shop in San Francisco, California is collecting NASA Technical Support Packages which pertain to the welding of aluminum, so as to keep abreast of what's going on.

<u>Subject</u>	<u>Technology Source</u>
Williams Aluminum Company 43 Gilbert Street San Francisco, California 94103 415-863-4556	Manned Spacecraft Center Tech Briefs: 66-10125, 66-10443
Contact: Dwight E. Williams Owner	Marshall Space Flight Center Tech Briefs: 67-10177, 67-10183

The Williams Aluminum Company is a small, family owned metal fabrication shop. The firm handles only nonferrous metals (primarily aluminum and magnesium) and does all types of custom fabrication including ornamental and architectural work. Mr. Dwight Williams, present owner, stated that his father had been in the welding business for over twenty years, prior to his death two years ago. Dwight joined his father's business about ten years ago, and took over the company after his father's death.

Mr. Williams performs about ninety percent of the work, claiming that his is "the only welding he can trust." He said that his job kept him very busy and the work was progressing satisfactorily. The number of employees the firm uses is dependent on the available work, usually no more than four persons at any one time.

Two years ago, Mr. Williams went to the Small Business Administration to obtain any suggestions they might have for him. Small Business Administration suggested the use of NASA publications; since that time Mr. Williams has become a regular recipient of the publications, but there was no one particular Tech Brief that he could cite as significantly contributing to his work. He personally reads each Brief, then places it in a binder for possible future reference. He said that he picks up little tips here and there for improving his welding techniques, and "all things added together, they (the NASA publications) have made a hell of a difference (in the quality of his work)."

APPENDIX C

Case Studies of Five Frequently Requested Technical Support Packages

APPENDIX C-1
A CASE STUDY OF USERS OF INORGANIC PAINT

(Tech Brief 65-10156, "Inorganic Paint Is Durable, Fireproof,
Easy to Apply")

Background

An inorganic paint suitable for coating satellites was developed in 1964 by NASA scientists at the Goddard Space Flight Center. The paint provided needed protection for surfaces exposed to such extreme environmental conditions as very high and low temperatures, ultra-violet radiation, and particle bombardment. Research had shown that organic-constituent coatings do not perform well under such conditions, and known inorganic coatings were not readily adaptable to such uses because of inadequacies in adhesion, spreadability, or sealing qualities. NASA carried out a research program to improve existing inorganic paints. Early results of that research were released in a Tech Brief 64-10026, "Alkali-Silicate Vehicle Forms Durable, Fireproof Paint." Problems with the curing and water solubility of the paint, however, indicated the need for additional research. Through subsequent investigation, scientists managed to develop an improved inorganic paint. The one major obstacle to its unqualified success has been difficulty of producing the paint in large quantities.

Information Dissemination

In June, 1965, Tech Brief 65-10156, "Inorganic Paint is Durable, Fireproof, Easy to Apply," was released by Goddard. A 30 page TSP also was prepared. It described the paint formulation and called readers' attention to the fact that realization of full-scale production would undoubtedly require additional research efforts. The Tech Brief received extensive coverage in trade and business journals.

NASA had processed 269 requests for additional information on the inorganic paint by March, 1968. As would be expected, many (40 percent) of the requests came from the chemical industry, with the remainder from other types of manufacturing and government organizations. The company size distribution indicated that a large percentage of small companies were interested in the paint. This may have been a reflection, in part, of the extensive trade publication coverage of the Tech Brief.

Evaluation of Information Transfer

Each of the requesters was sent a questionnaire six months after receiving the TSP. One hundred thirty-seven of the questionnaires were returned by mid-1968. Thirty-nine percent of the respondents indicated that they first learned about the availability of the TSP through a NASA publication. An additional 36 percent learned about the TSP through journals and personal contacts.

Almost twenty percent of the respondents indicated that the information was of significant value to their work:

Evaluation of Information	Number of Responses	Percent
Limited value to work	49	35.8
Increased state-of-the-art knowledge	47	34.3
Great value to work	17	12.4
New product or process	6	4.4
Not applicable to work	11	8.0
Other	6	4.4
No answer	1	0.7
TOTALS	137	100.0

Telephone Interviews

In order to gain further insight into the use of the information, 33 respondents were contacted for a telephone interview.

Highlights from some of these interviews are presented to suggest the variety of problems and successes that have been experienced by TSP users:

- A Minnesota paint manufacturer has had to suspend development efforts because of internal resource limitations and external demands which required the complete attention of the laboratory staff.
- A Los Angeles electronics firm attempted to use an inorganic paint to insulate the coils of an air data computer. At the time there were no Federal specifications regarding the inorganic coating, and the application was not made.

- A small Pennsylvania subsidiary of an electronics company engaged in the production of coatings has found the NASA information useful in "eliminating guesswork in additives" in existing lines.
- Columbia Products Corporation, Columbia, South Carolina, is developing a coating for pole line hardware.
- A Southern machinery manufacturer is developing a coating for protection of surfaces exposed to salt water.
- A small paint manufacturer in the Pacific Northwest is formulating an interior latex paint, but has experienced considerable difficulty in finding the required ingredients.
- The Bradley-Van Holm Chemical Corporation, Brattleboro, Vermont, is evaluating the NASA formulations to develop an interior fireproof coating.
- Ben Pinsker, Downey, California, working in his home laboratory is believed to have reached the stage of final experiments with a formulation based on work that he had been doing over the past three years. Tech Brief 65-10156 provided key information regarding timing of mixture of different ingredients.

Several companies indicated that they had successfully developed and were either promoting or marketing a new product. Some of those products were developed directly from NASA formulations. Included in the last group are organizations which are not manufacturing an inorganic paint for the market, but are using it within the organization. Companies marketing an inorganic coating include: J. W. Mortell Company, Kankakee, Illinois; Sperex Corporation, Los Angeles; and Lithoid Corporation, Lima, Pennsylvania. Advanced Research Corporation, Atlanta, Georgia, uses an inorganic coating for lithium compound containers employed in nuclear research. United Coatings Incorporated of Chicago is marketing a product described as "Satellite Latex Silicate Interior Flatpaint." United Coatings engineers adapted NASA inorganic paint to their needs by adding organic compounds (e.g., latexes) to develop a paint with universal adhesive properties.

Transfer Barriers

One of the principal problems in transferring inorganic paint technology concerns the complexities of basic formulation. Inorganic materials require a knowledge of chemistry usually more sophisticated than that available in smaller paint companies. Thus, while the TSP is

quite encompassing, it does not give enough detail for many requesters. The paint formulation also requires very exacting mixing procedures that do not readily permit the production of large batches.

APPENDIX C-2

A CASE STUDY OF USERS OF A NONDESTRUCTIVE TESTING HANDBOOK

(Tech Brief 67-10374, "Handbooks Describe Eddy Current Techniques Used in Nondestructive Testing of Metal Parts and Components")

Background

The unique nature of the hardware used in NASA's programs presents a number of similarly unique problems in quality assurance of that hardware. Traditional types of quality control tests consist of a test-to-failure (destructive test) approach. This testing method generally presumes a large number of similar pieces and a well-structured sampling procedure. With space hardware, such an approach is neither practical nor economical because of limited production. Thus, it has been necessary to develop nondestructive testing (NDT) procedures. Such testing, while evaluating the quality of the item, does not destroy or alter its performance characteristics.

One of the most successful approaches to NDT has been to use electrical field eddy current patterns to detect flaws and defects in metals. Because of the relative success of this approach, a great deal of interest has been shown in NDT techniques. Employees' lack of familiarity with NDT, however, has prevented a full utilization of the techniques. To solve this problem the Convair Division of General Dynamics developed a set of programmed learning handbooks to aid in the training of personnel involved in nondestructive testing.

Information Dissemination

The availability of the 700 page, three-volume set of NDT handbooks was announced by the Marshall Space Flight Center in Tech Brief 67-10374, "Handbooks Describe Eddy Current Techniques Used in Nondestructive Testing of Metal Parts and Components". A number of professional and trade journals published items announcing the availability of these handbooks.

Requests for additional information on the NDT handbooks numbered 150 by August, 1968. The majority of the requests came from manufacturing firms.

Evaluation of Information Transfer

Each of 150 requesters was sent a questionnaire. Of the 150 questionnaires sent, 99 were returned. An unusually high number (88 percent) of the respondents learned about the availability of the TSP in NASA documents, mainly Tech Briefs. Follow-up interviews indicated, however, respondents sometimes had given NASA documents credit when they actually had learned about the TSP's in a trade journal.

A relatively large number of respondents indicated that the TSP was of significant value:

Evaluation of Information	Number of Responses	Percent
Increased my knowledge of state-of-the-art	54	54.5
Provided information of limited value to my work	26	26.3
Provided information of great value to my work	12	12.2
Not applicable to my work	2	2.0
Other	1	1.0
No answer	<u>4</u>	<u>4.0</u>
TOTALS	99	100.0

Telephone Interviews

Fourteen of the respondents were interviewed by telephone. The interviews were concerned with the basis for inquiry, an evaluation of the information, current applications, and what future use might be anticipated. The following selected comments were received:

Inquiry Basis

- Article in NDT journal--wanted to check the state-of-the art.
- Review Tech Briefs for possible relevance to work.
- Librarian reviews topics and refers relevant references to engineers who order, review, and classify information (keep-discard).

- Wanted information to train technicians.
- Saw article in Plating Journal, need NDT for plating.

Evaluation

- Valuable and adequate.
- Adequate for training staff.
- Very good (information would have cost \$2,000 to retrieve).
- Good reference (other sources make it seem mysterious, not objective).

Application

- Review for development of eddy current instrument manuals.
- Formal seminars for technicians and salesmen of NDT instruments
- Using eddy current testing because NASA manuals on NDT were available and convinced them it was worth the move.
- Use in in-plant training (especially like the programmed learning).
- Background for lecture notes in a new course.

Future

- Should be applicable for a long time.
- Long-range.
- Continued use.
- Continuing as reference.

APPENDIX C-3

A CASE STUDY OF USERS OF THE MINIATURE
PRESSURE TELEMETRY SYSTEM(Tech Brief 66-10624, "Miniature Pressure
Telemetry System")Background

A pressure transducer coupled to a telemetry system was developed in biomedical research conducted during 1965 at Ames Research Center. The basic purpose of the device is to monitor physiological changes occurring in animals. The pressure transducer is very small, is implantable in animal tissue, and operates dependably on a low supply of power..

Information Dissemination

The pressure telemetry system was used in experiments at Ames during 1965 and 1966. The results of the experiments led to the preparation of Tech Brief 66-10624 and the presentation by Mr. T. B. Fryer of a paper at a national biomedical conference in November, 1966. Since that time, several articles on the topic have appeared in such publications as: Medical Research Engineering, Medical Electronic News, and the Journal of Applied Physiology.

By August, 1968, there were 63 requests for additional information on the telemetry device. The majority of the requests came from groups involved in biological research (e.g., medical schools). Electronic instrumentation manufacturers constituted the second largest group of requesters.

Evaluation of Information Transfer

Each of the 63 requesters was sent a questionnaire and 51 were returned. Twenty of the respondents indicated that they became aware of the availability of the TSP through NASA publications (primarily the associated Tech Brief). Another twenty learned about the TSP through professional journals and personal contacts. Eleven respondents said they had written to NASA in search of general telemetry information and had not known about the availability of this specific Technical Support Package.

The following table indicates the general evaluation of TSP information given by the respondents:

Evaluation of Information	Number of Responses	Percent
Increased my knowledge of state-of-the-art	21	41.2
Provided information of limited value to my work	11	21.6
Provided information of great value to my work	11	21.6
Not applicable to my work	3	5.8
No answer	<u>5</u>	<u>9.8</u>
TOTALS	51	100.0

Telephone Interviews

In order to obtain further insight into uses and evaluations of the TSP, ten requesters were contacted by telephone. They were selected because they indicated in their returned questionnaire that the TSP information had been very valuable in their work.. The interview focused on the basis for their TSP inquiry, an evaluation of the information, current applications, and what future use might be anticipated. The following selected comments were received:

Inquiry Basis

- Regular review of NASA documents--interest is in marketable products in biomedical field.
- Article in Medical Electronics, working in animal research not aware of Tech Briefs.
- Personal contact referred to NASA Tech Brief--wrote to Ames for information on general telemetry in biology experiments. Not aware of Tech Brief service.
- Reads Tech Briefs regularly and wanted to check the state-of-the-art on telemetry.
- Article in Medical Electronics--was looking for packaged biotelemetry system for animal research.
- Article in Medical Electronics--looking for potentially marketable instruments in biomedical area.

Evaluation of TSP Information

- Information was too sophisticated for application.
- Information not applicable, but general telemetry was helpful. (Would prefer that manufacturers make the first move).
- Generally adequate and documents accurate.
- Information sometimes out-of-date and components are seldom standard items.
- Used the data effectively in component fabrication.

Application

- Reviewed for possible future use.
- Built a system with TSP data (less cost than commercial model).
- Purchased commercial system on the basis of the information in the TSP. System was then modified for use.

Future Use

- Applications possible.
- Possible applications because of the increased emphasis on patient safety in hospitals.
- Transmitter use will continue.

Transfer Barriers

Several major problems have lessened the apparent utility of the pressure transducer. The potential user markets (e.g., medical researchers) for such devices are not well versed in sophisticated electronic circuitry, and its application often requires special modifications to eliminate electrical interference. With such a user situation, manufacturers are placed in the position of having to provide a high-reliability instrument that is simple to use. These requirements give telemetry systems a very low priority for development and production expenditures.

A second barrier to the transfer of pressure transducer technology concerns the cost and availability of components. Because of the magnitude of NASA research, aerospace scientists have access to many

expensive and rare components that may not be available to other scientists. When research groups outside of NASA try to duplicate the sophisticated electronic circuitry involved, they sometimes find that sources of needed components are difficult for them to locate and, when located, that the components are prohibitively expensive.

APPENDIX C-4

A CASE STUDY OF USERS OF A TUBE REDUCER

(Tech Brief 67-10401, "Metal Tube Reducer is Inexpensive and Simple to Operate")

Background

Scientists at the Argonne National Laboratory conduct research on the design of nuclear reactors. An important phase of their work is the development of metal fabrication technology for refractory tubing. The process consists of casting, reducing, and drawing rhenium-base alloy tubing. One problem in the process concerns the reduction of the casting billets. Engineers in the Metallurgy Division at Argonne were successful in developing a reducer that retains the smooth inside surface of the tubes, yet does not require extensive floor space as do standard tube drawing beds.

Information Dissemination

Following successful application of the tube reducer at Argonne, Tech Brief 67-10401 was prepared as a part of the joint NASA-AEC Technology Utilization Program. The Tech Brief was publicized in American Machinist, Engineering Journal, Engineering Materials and Design, Iron and Steel, Mechanical Engineering, Metal Working, Steel, and Washington Science Trends.

Requests for TSP's numbered 61 by August, 1968. These requests were handled by the Office of Industrial Cooperation of Argonne.

The majority (55 percent) of the requesters came from metals and machinery fabricators. One-half of the requesting firms were listed in Dun & Bradstreet, and the majority had employment of more than 10,000.

Evaluation of Information Transfer

Questionnaires were mailed to the 61 requesters; 39 questionnaires were returned. Fifteen (39 percent) of the respondents indicated that they became aware of the information through NASA publications. An additional 36 percent learned of the information through journals and other publications.

The following table indicates the general evaluation of the TSP information:

Evaluation of Information	Number of Responses	Percent
Provided information of limited value to my work	18	46.2
Increased my knowledge of state-of-the-art	11	28.2
Not applicable to my work	6	15.4
Other	3	7.7
No answer	<u>1</u>	<u>2.5</u>
TOTALS	39	100.0

Transfer Barriers

Most fabricators have been reluctant to manufacture the tube reducer because of its extremely limited and specialized types of applications. TSP requesters said that the Tech Brief had created their original interest, but that the design reported in the TSP simply was not applicable to their work.

The lack of any indicated applications of the reducer seems to stem from the two problems. First, the design was not intended for high-volume production uses. Second, the majority of requesters appeared to feel that the production of special alloy tubing for nuclear applications is too limited in sales potential to merit the necessary investment to make a commercial version of the tube reducer.

APPENDIX C-5

A CASE STUDY OF USERS OF VIS-A-PLAN

(Tech Brief 67-10240, "Vis-A-Plan Management Technique")

Background

One of the best known aerospace management procedures is the Project Evaluation and Review Technique (PERT). The usefulness of PERT, however, has been limited to the management of very large enterprises. Management specialist Nathan Ranck, while working on a NASA contract, developed a visual display technique which reduced the complexities of PERT analysis. The technique, known as Vis-A-Plan, was used for scheduling ground support activities at Cape Kennedy.

Information Dissemination

Ranck first described the Vis-A-Plan technique in a paper copyrighted in 1966. In the following year, he prepared Tech Brief 67-10240, "Vis-A-Plan Management Technique." The Tech Brief was described subsequently in several trade publications, including Ceramic Age and the Journal of Industrial Engineering.

By August, 1968, persons in 58 different organizations had requested copies of the Vis-A-Plan TSP. Requests came from managers, scientists, engineers, and others working for organizations of various sizes and in many industries.

Applications

Questionnaires returned by 38 of the 58 requesters indicated that Vis-A-Plan TSP's were used primarily as teaching aids in project management training programs. Four requesters indicated that the TSP's were significant value in direct applications to project management situations.

Evaluations

The following table shows the evaluations of Vis-A-Plan TSP's by the 38 questionnaire respondents:

Requester Evaluations of Vis-A-Plan TSP's	Number of Responses	Percent
Increased my knowledge of state-of-the-art	14	36.8
Provided information of limited value to my work	14	36.8
Provided information of great value to my work	2	5.3
Not applicable to my work	3	7.9
Other	3	7.9
No answer	2	5.3
TOTALS	38	100.0

Telephone Interviews

In order to obtain further insight into the use of the information, five requesters who indicated that the information was valuable were contacted by telephone. They were asked the basis for their inquiry, their evaluation of the information, current application of the information, and what future use might be anticipated. The following selected comments were received:

Inquiry Basis

- First noticed in a Tech Brief. The company works on government contracts that are more and more requiring scheduling technique.
- Company groping for a new technique to manage and control engineering projects (cost and time overruns).
- Noticed Tech Brief and sent for TSP.
- Reviews Tech Briefs. Needed a tool to plot (chart) a new product development.
- Noticed article in the trade publication Ceramic Age. Sent for additional information from Kennedy Space Center.

Evaluation of TSP Information

- Attributes are simplified presentation of events and dates. Can be used to present PERT data using a time scale. Fits needs better than any roughly similar technique.

- Excellent reporting tool to management and much more clearly understood than PERT.
- A very simple technique for displaying a PERT analysis. Visual display allows rapid assessment of project status.

Application

- Transferred its engineering projects to Vis-A-Plan. Minimal staff time required to keep it up-to-date.
- Applied to charting product development and a building demolition project.
- Scheduled a design project to introduce a new product into sales line.
- Used to schedule unique patent exploitation project design class for engineering college students.

Future Use

- Expect to use it as government pressure for scheduling procedures increases.
- Continuing use to improve operations of other divisions of the company.
- Encouraging plant-wide use of the technique.

Transfer Barriers

On the basis of the questionnaire returns and telephone interviews, it would appear that this Tech Brief information has been successfully transferred to those persons who have a need for such a technique. The only indications of a negative response to the information can be categorized into two groups: those who are already quite familiar with the PERT system and take full advantage of its analysis potential, and those who have almost no concept of formal project scheduling techniques.

